Rockwell International

Collins instruction book

Collins Telecommunications Products Division

628K-1
Receiver-Transmitter

Intermediate Maintenance

CUSTOMER SERVICE INFORMATION

EQUIPMENT/MANUAL REGISTRATION

MANUAL TITLE _____

MANUAL PART NO _____

USER'S NAME _____

ADDRESS _____

_____ ZIP: _____

EQUIPMENT TYPE NO	EQUIPMENT PART NO	SERIAL NO

YOU MUST COMPLETE AND RETURN THIS FORM TO RECEIVE ADDITIONAL MATERIALS.

Please indicate desired services. QTY

☐ Manual Revisions _____

☐ Service Bulletins/Service Information Letters _____

☐ Instruction Books (Indicate Type)

(TITLE)	(PART NO)	(QTY)

Rockwell-Collins has endeavored to furnish you with an accurate, up-to-date manual. We welcome your comments concerning this manual. Please use the following space to report any errors, discrepancies, or omissions as well as any general comments you wish to make.

REMARKS:

ATTN: QUALITY CONTROL-
TECHNICAL PUBLICATIONS 120-120

PLACE
STAMP
HERE

Logistics
Collins Telecommunications
Products Division
Rockwell International
Cedar Rapids, Iowa 52498

● 523-0772835-001611
1 September 1983

Rockwell International

Collins instruction book

628K-1 Receiver-Transmitter

Intermediate Maintenance

Collins Telecommunications
Products Division
Defense Electronics Operations
Rockwell International
Cedar Rapids, Iowa 52498

Printed in the United States of America

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

Please be advised that completion and return of the enclosed Customer Service Information sheet to Rockwell International ensures you of manual revisions and service bulletin modifications to your equipment. Without the return of this sheet, Rockwell International bears no responsibility to forward this information to you.

Caution

The material in this manual is subject to change. Before attempting any maintenance operation on the equipment covered in this manual, verify that you have a complete and up-to-date publication applicable to your equipment.

We welcome your comments concerning this instruction book. Although every effort has been made to keep it free of errors, some may occur. When reporting a specific problem, please describe it briefly and include the instruction book part number, paragraph or figure number, and page number.

Send your comments to: Logistics
Collins Telecommunications
Products Division
Rockwell International
Cedar Rapids, Iowa 52498

ATTN: Quality Control-Technical Publications 120-120

Page No	*Change No
Front Matter (523-0772835-001611) 1st Ed — 1 Sep 83	
Title	0
A	0
i thru iii	0
iv Blank	0
v thru vi	0
Section 1 Description	
1-1 thru 1-5	0
1-6 Blank	0
Section 2 Installation	
2-1 thru 2-3	0
2-4 Blank	0
2-5 thru 2-7	0
2-8 Blank	0
Section 3 Operation	
3-1 thru 3-13	0
3-14 Blank	0
Section 4 Theory	
4-1 thru 4-3	0
4-4 Blank	0
4-5 thru 4-7	0
4-8 Blank	0
4-9	0
4-10 Blank	0
Section 5 Maintenance	
5-1 thru 5-18	0
Section 6 Parts List	
6-1 thru 6-15	0
6-16 Blank	0
Section 7 Diagrams	
7-1	0
7-2 Blank	0
7-3	0
7-4 Blank	0

*Zero in this column indicates an original page.

table of contents

Page

Section 1 Description

1.1 General 1-1
1.1.1 628K-1 Receiver-Transmitter 1-1
1.1.2 938X-1 Broadband Antenna 1-1
1.2 Equipment Supplied 1-1
1.3 Associated Equipment for Man-Pack Configuration 1-2
1.3.1 Man-Pack Configuration 1-2
1.3.2 Vehicular Configuration 1-2
1.4 Equipment Specifications 1-4

Section 2 Installation

2.1 Unpacking and Inspection 2-1
2.2 Preparation for Storage/Reshipment 2-1
2.3 Preinstallation Check 2-1
2.4 Cabling 2-1
2.5 Installation Procedures 2-1
2.5.1 Location Considerations 2-1
2.5.2 Receiver-Transmitter Installation 2-1
2.6 Postinstallation Check 2-2
2.7 Connector Pin Identification 2-2

Section 3 Operation

3.1 General 3-1
3.2 Controls, Indicators, and Connectors 3-1
3.3 Operating Procedures 3-3
3.3.1 Built-In Test (BIT) 3-3
3.3.2 Fixed Frequency (NO HOP) 3-5
3.3.3 Channel Scanning (SCAN) 3-5
3.3.4 Frequency Hopping (HOP) 3-6
3.3.5 Net Control Station (NCS) 3-8
3.3.6 Paging a Net Control Station Radio Set (PAGE) 3-8
3.3.7 Time (TIME) 3-9
3.3.8 628K-1 Receiver-Transmitter Operation in the AM-2060/GRC Amplifier-Power Supply 3-10
3.3.9 MP-83 Radio Set Radio Relay Using Electrical Cable Assembly CX-4656/GRC 3-11
3.3.10 MP-83 Radio Set Remote Control Using Radio Set Control AN/GRA-39 3-12

Page

Section 4 Theory

4.1 General 4-1
4.2 Functional Theory 4-1
4.2.1 Overall Unit 4-1
4.2.2 Receive 4-1
4.2.3 Transmit 4-5
4.2.4 Microprocessor 4-5
4.2.5 Power Distribution 4-6
4.2.6 Display 4-6

Section 5 Maintenance

5.1 General 5-1
5.2 Test Equipment 5-1
5.3 Testing and Troubleshooting 5-2
5.3.1 General 5-2
5.3.2 Test Setup 5-2
5.3.3 Receiver-Transmitter Overall Check 5-2
5.3.4 Minimum Performance Test 5-5
5.4 Signal Definitions 5-14
5.5 Adjustments 5-15
5.6 Disassembly/Assembly 5-15
5.6.1 Disassembly 5-15
5.6.2 Assembly 5-17

Section 6 Parts List

6.1 Introduction 6-1
6.1.1 General 6-1
6.1.2 Group Assembly Parts List 6-1
6.1.3 Numerical Index 6-1
6.1.4 Reference Designation Index 6-1
6.1.5 How To Use This Parts List 6-1
6.1.6 Manufacturer's Code, Name, and Address 6-1
6.1.7 Reference Designation Prefixes 6-3
6.1.8 Configuration Identifiers 6-3
6.2 Group Assembly Parts List 6-4
6.3 Numerical Index 6-13
6.4 Reference Designation Index 6-15

Section 7 Diagrams

7.1 Configuration Status Control 7-1
7.2 Configuration Effectivity 7-1

list of illustrations

Figure		Page
Section 1 Description		
1-1	Equipment Supplied	1-2
1-2	Associated Equipment for Man-Pack Configuration	1-3
1-3	Associated Equipment for Vehicular Configuration	1-3
Section 2 Installation		
2-1	Outline and Mounting Dimensions	2-3
2-2	Man-Pack Installation	2-5
2-3	Vehicular Installation	2-6
2-4	Connector Pin Identification	2-7
Section 3 Operation		
3-1	Controls, Indicators, and Connectors	3-1
3-2	Test Display	3-3
3-3	Receive Pass Display	3-3
3-4	Receive Fault Display	3-3
3-5	Transmit Pass Display	3-4
3-6	Transmit Fault Display	3-4
3-7	No Hop Display	3-5
3-8	Channel Scanning (SCAN) Display	3-5
3-9	Frequency Hopping (HOP) Display	3-7
3-10	Key Number Loading Display	3-7
3-11	Manual Time Loading Display	3-7
3-12	Net Control Station (NCS) Display	3-8
3-13	Transmitting Page Display	3-8
3-14	Net Control Station (NCS) Receiving Page Display	3-9
3-15	Receiver-Transmitter Transmitting Time Display	3-9
3-16	Receiver-Transmitter Requesting/ Receiving Time Display	3-10
3-17	628K-1 Receiver-Transmitter Installed With AM-2060/GRC Amplifier-Power Supply	3-10
3-18	Radio Relay Using Electrical Cable Assembly CX-4656/GRC	3-12
3-19	Remote Control Using Radio Set Control AN/GRA-39	3-12
Section 4 Theory		
4-1	628K-1 Receiver-Transmitter, Simplified Block Diagram	4-2
4-2	628K-1 Receiver-Transmitter, Functional Block Diagram	4-3
4-3	Power Distribution	4-7
4-4	Display, Schematic Diagram	4-9
Section 5 Maintenance		
5-1	Test Display	5-2
5-2	Receive Pass Display	5-2
5-3	Receive Fault Display	5-2
5-4	Transmit Pass Display	5-3
5-5	Transmit Fault Display	5-4
5-6	Test Setup	5-13
5-7	Receiver-Transmitter With Backplate Removed	5-16
Section 6 Parts List		
6-1	628K-1 Receiver-Transmitter and 938X-1 Broadband Antenna	6-4
6-2	628K-1 Receiver-Transmitter	6-5
6-3	Chassis A1	6-7
6-4	Display Board A1A1	6-11
6-5	938X-1 Broadband Antenna	6-12
Section 7 Diagrams		
7-1	628K-1 Receiver-Transmitter, Interconnect Diagram	7-3

list of tables

Table		Page
Section 1 Description		
1-1	Equipment Supplied	1-1
1-2	Associated Equipment for Man-Pack Configuration	1-2
1-3	Associated Equipment for Vehicular Configuration	1-2
1-4	628K-1 Receiver-Transmitter Equipment Specifications	1-4
Section 3 Operation		
3-1	Controls, Indicators, and Connectors	3-2
3-2	Fault Abbreviations for Receive	3-3
3-3	Fault Abbreviations for Transmit	3-4
Section 5 Maintenance		
5-1	Test Equipment	5-1
5-2	Receive Faults	5-3
5-3	Transmit Faults	5-4
5-4	Minimum Performance Tests	5-5
5-5	Input/Output Signal Definitions	5-14

DESIGN FEATURES

The 628K-1 Receiver-Transmitter is a state-of-the-art receiver-transmitter with electronic counter-countermeasures (ECCM) capabilities.

All controls are on the front panel of the receiver-transmitter and have been designed for ease of operation and minimal operator training.

The receiver-transmitter provides 2320 channels in the vhf band from 30 to 87.975 MHz at 25-kHz channel spacing, with a transmit power level of either 0.25 watts or 5 watts.

The receiver-transmitter has two main modes of operation: fixed frequency (NO HOP) and frequency hopping (HOP). The remaining selectable modes — channel scanning (SCAN), net control station (NCS), and time (TIME) — are used in conjunction with either fixed frequency (NO HOP) or frequency hopping (HOP). Channel scanning (SCAN) is used in conjunction with fixed frequency (NO HOP). Net control station (NCS) and time (TIME) are used in conjunction with frequency hopping (HOP).

A feature of the receiver-transmitter is the built-in test (BIT) which provides fault isolation to the module level and identifies low battery power and antenna faults. Operational status of the radio set is provided to the operator by a liquid crystal display (LCD).

INSTRUCTION BOOK

This instruction book includes all necessary information for repair of the receiver-transmitter to a faulty subassembly (circuit card).

628K-1 Receiver-Transmitter

SERVICE BULLETINS/SERVICE INFORMATION LETTERS

All 628K-1 Receiver-Transmitter service bulletins (SB) and service information letters (SIL) incorporated in this instruction book are listed below. Applicable service bulletins and/or service information letters released after printing, but prior to shipment, of the instruction book are inserted in the front of the instruction book.

Note

Service bulletins are numbered in sequence for the life of the equipment. Service information letters are numbered in sequence starting at 1 for each calendar year.

SB/SIL	DESCRIPTION	ISSUE DATE
None issued at time of printing.		

section 1
description

1.1 GENERAL

The 628K-1 Receiver-Transmitter is a direct replacement for the RT-841/PRC-77 Receiver-Transmitter. In the man-pack configuration, accessories such as the battery, the battery box, the handset, and the harness are still used. In the vehicular configuration, the receiver-transmitter is combined with the 648W-1 Vehicular Power Amplifier to provide 50 watts of rf power to the vehicular antenna. Listed in the following paragraphs is a description of the receiver-transmitter and the antenna that is supplied.

1.1.1 628K-1 Receiver-Transmitter

The 628K-1 Receiver-Transmitter is the main portion of the radio set. The unit consists of the receiver, the transmitter, and all the controls and indicators necessary for operation of the radio set. The receiver-transmitter permits the operator to select output power, mode of operation, channel/day selection, squelch setting, and either operating frequency, net identifier, or time. The receiver-transmitter provides 2320 channels in the vhf-FM range of 30 to 87.975 MHz at a channel spacing of 25 kHz. The receiver-transmitter also provides electronic counter-countermeasures (ECCM) capabilities. The ECCM capabilities are composed of net identifiers (000 to 799) and a key number (0000 to 9999), both of which are operator selectable. Power for the receiver-transmitter may be supplied from two sources. One is from the battery connector (J5) on the back panel of the receiver-transmitter. This source is used in the man-pack configuration. The second is through PWR connector (J1) on the front panel of the receiver-transmitter. With the shorting cap (P3) removed, external power is supplied to the receiver-transmitter. Power through J1 is used when in the vehicular configuration.

1.1.2 938X-1 Broadband Antenna

The 938X-1 Broadband Antenna provides unlimited full band (30 to 87.975 MHz) frequency hopping. The antenna is attached directly to the front panel of the receiver-transmitter.

1.2 EQUIPMENT SUPPLIED

Table 1-1 lists the equipment supplied. Refer to figure 1-1 for the equipment supplied.

Table 1-1. Equipment Supplied.

EQUIPMENT	PART NUMBER*
628K-1 Receiver-Transmitter	622-6604-001
938X-1 Broadband Antenna	622-6626-001

*Unless otherwise indicated, all part numbers are Rockwell-Collins.

1.4 EQUIPMENT SPECIFICATIONS

Equipment specifications are listed in table 1-4.

Table 1-4. 628K-1 Receiver-Transmitter Equipment Specifications.

CHARACTERISTIC	SPECIFICATION	
Frequency range	30 to 87.975 MHz in 25-kHz steps (2320 channels)	
Preset channel selection	9 — NO HOP/fixed frequency presets 9 — HOP/frequency hopping presets	
Modes of operation	NO HOP	Fixed frequency communications with vhf 30- to 87.975-MHz FM type radios.
	HOP	104 frequency hops per second on any frequency between 30.000 and 87.975 MHz, on 25-kHz channel spacing. Digital voice and digital data, between two 628K-1 Receiver-Transmitters, bursted 20 kb/s data, resync every second.
	TIME	Fixed frequency automatic time transfer and digital voice between two 628K-1 Receiver-Transmitters, bursted 20 kb/s data.
	NCS	Available in HOP only, net control station (NCS) auutomatically transmits time update for non-NCS stations to update their internal digital quartz clocks.
	SCAN	Available in NO HOP only, compatible with receiver-transmitters with 150-Hz tone squelch, scans preset channel presently selected on display plus three additional preset channels 7, 8, and 9.
ECCM codes		
Net identifier	800 ECCM net identifiers (000 to 799)	
Key number	10 000 ECCM key numbers (0000 to 9999)	
Hopping rate	104 hops per second	
Receiver		
Sensitivity	From 20 dBm to -113 dBm for +10-dB sinad minimum	
Audio output	12 mW into 1000 Ω	
If rejection	100 dB minimum	
Adjacent channel rejection	Greater than 60 dB, 2 channels away	
Squelch	150-Hz tone	
Modulation	NBFM (F3) for data and voice with a deviation of ±7 kHz	
Transmitter		
Power output	Selectable 0.25 W, 5 W	

Table 1-4. 628K-1 Receiver-Transmitter Equipment Specifications (Cont).

CHARACTERISTIC	SPECIFICATION
Primary power	Input voltage between 10 and 15 V dc. Power consumption at 12.5-V dc input voltage is less than: 2.5 watts - receive 11.3 watts - low-power transmit (0.25 W) 28 watts - high-power transmit (5 W)
Frequency stability	1.6×10^{-5} at 30 MHz 0.88×10^{-5} at 88 MHz
Harmonic radiation	At least 45 dB below carrier
Audio bandwidth	Voice: 300 to 3000 Hz Data: 10 Hz to 10 kHz
Wide-band noise	At least 117 dB below rated output at ±10% from carrier in a 16-kHz bandwidth (-122 dBm/Hz)
Physical characteristics	
Dimensions	Width: 28 cm (11 in) Height: 10 cm (4 in) Depth: 28 cm (11 in) Direct replacement for RT-841/PRC-77
Weight	4.04 kg (8.9 lb)
Environmental	
Temperature	-40 to +66 °C (-40 to 151 °F)
Humidity	Up to 100%
Altitude	4572m (15 000 ft)
Submersion	Down to 0.91 m (3 ft)
Shock	48-in drop on each face, edge, and corner, 26 drops, as per MIL-STD-810C, Method 516.2 Procedure II, approx 1200 G, 0.2 ms
Vibration	MIL-STD-810C, Method 514.2 Procedure VIII, category f of figure 514.2-6 in the range of 5 to 55 to 5 Hz
Drop test	MIL-STD-810C, Method 516.2 Procedure V, 4-in drop on each practicable face, 4 times each face, 24 drops
Sand and dust	MIL-STD-810C, Method 510.1 Procedure I, air velocity of 1750 ft/min
Reliability	4350 h
Maintainability	0.25 h

section 2
installation

2.1 UNPACKING AND INSPECTION

The equipment should be handled with care when unpacking. Carefully remove the equipment from its container. Inspect the equipment for possible damage that may have occurred in shipment. If damage is found, notify the nearest Rockwell-Collins agency. Check the equipment against the packing list. Save the original container, fillers, and packing material for use when the equipment is repacked for storage or reshipment.

Warning

This device contains a radio frequency transmitter which, when operated into an antenna, may produce electromagnetic fields in close proximity to the antenna that are in excess of Occupational Safety and Health Administration (OSHA) recommended maximum limits.

2.2 PREPARATION FOR STORAGE/RESHIPMENT

Pack the equipment in its original container (if available). Brace the equipment in the same manner used for original shipment. Pack the container with filler for protection of the equipment during storage or shipping. Include desiccant in the packing to absorb moisture.

2.3 PREINSTALLATION CHECK

The equipment has been properly aligned and tested before delivery. However, to ensure proper functioning of the equipment prior to installation, a preinstallation test should be performed. Refer to performance test procedures in the maintenance section. Successful completion of the tests indicates that the equipment is functioning within acceptable limits.

2.4 CABLING

Observe the following precautions when installing interconnecting wiring.

a. For audio and microphone line connections, use twisted shielded wire for minimum pickup of electrostatic and magnetic fields.
b. Leave sufficient slack in wires to prevent damage due to vibration and to provide for disconnecting the cables when removing an equipment item.
c. Avoid sharp bends in all cables.

2.5 INSTALLATION PROCEDURES

The following procedures are basic to attaining a good operational installation for the radio set. Refer to figure 2-1 for outline and mounting dimensions.

2.5.1 Location Considerations

The receiver-transmitter and its associated equipment should be located where the temperature range will not exceed -40 to +66 °C (-40 to +151 °F). Consideration should be given to ease of access to the equipment for maintenance purposes.

The equipment should be located as far away as possible from electrostatic and magnetic field generating equipment to prevent unwanted noise pickup.

2.5.2 Receiver-Transmitter Installation

The 628K-1 Receiver-Transmitter may be installed in either of two configurations, man-pack or vehicular.

2.5.2.1 Man-Pack Installation

Refer to figure 2-2 for the man-pack installation. The function switch on the front panel of the receiver-transmitter should be set to OFF during installation.

2.5.2.1.1 Installation of Battery and Battery Box to the Receiver-Transmitter

a. Place the receiver-transmitter with the front panel facing down.
b. Position the battery above the receiver-transmitter, making sure to align the pins of J5 on the receiver-transmitter with the pin socket on the battery.

c. Gently push the battery into place.
d. Place the battery box over the battery and secure it in place with the two latch assemblies on the receiver-transmitter.

2.5.2.1.2 Installing the Antenna to the Receiver-Transmitter

a. Place the receiver-transmitter with the front panel facing up.
b. Discard plastic protective cap that was supplied with the new antenna. Connect the antenna to ANT connector J2 and rotate in a clockwise direction until tight.

2.5.2.1.3 Installing the Handset to the Receiver-Transmitter

Connect the handset to the receiver-transmitter to AUDIO jack J3 or J4 by first pushing and then twisting in a clockwise direction to lock the handset in place.

2.5.2.1.4 Installing the Radio Set to the Harness

a. To mount the radio set to the harness, place the radio set on the harness with the two inside bottom corners of the battery box resting against the two metal lips on the harness.
b. Secure the radio set to the harness with the two M-type straps.

2.5.2.2 Vehicular Installation

Refer to figure 2-3 for the vehicular installation. The function switch on the front panel of the receiver-transmitter should be OFF during installation.

2.5.2.2.1 Installation of Receiver-Transmitter to Vehicular Power Amplifier

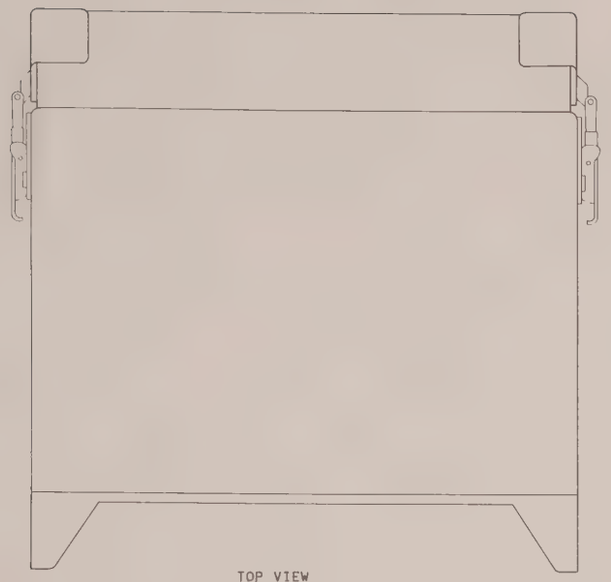
a. Place the receiver-transmitter on the vehicular power amplifier.
b. Secure the receiver-transmitter to the vehicular power amplifier with the two clasps on the front of the vehicular power amplifier.
c. Connect cables from SET PWR and RF IN on the vehicular power amplifier to PWR and ANT on the receiver-transmitter respectively.

2.6 POSTINSTALLATION CHECK

To ensure proper functioning of the equipment after installation, a postinstallation check should be performed. Refer to test procedures in the maintenance section. Successful completion of the tests indicates that the equipment is functioning within acceptable limits.

2.7 CONNECTOR PIN IDENTIFICATION

Refer to figure 2-4 for identification of the external connectors on the 628K-1 Receiver-Transmitter.



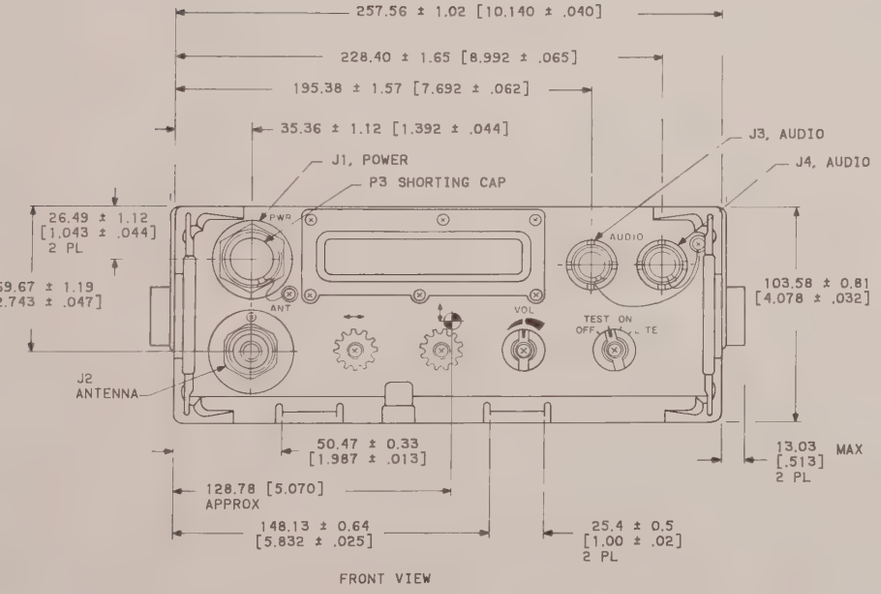
TOP VIEW

NOTES:

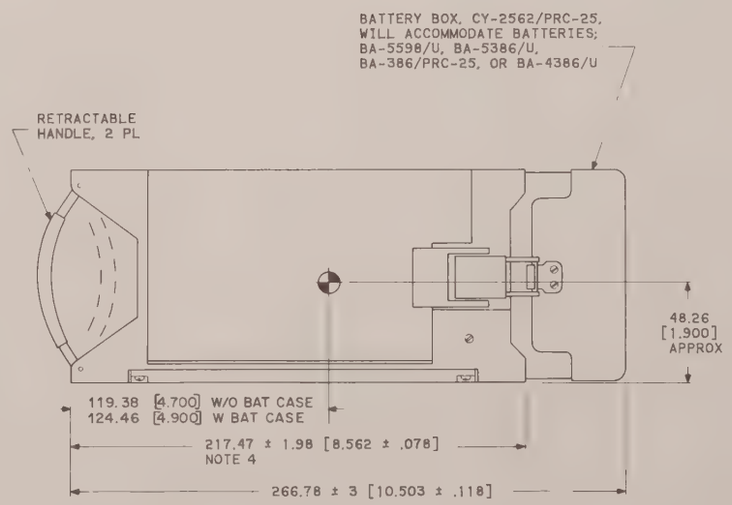
1. DIMENSIONS ARE IN MILLIMETRES [INCHES].
2. WEIGHT: 4.04 kg [8.9 LB] (APPROX).
   WEIGHT WITH BATTERY CASE: 4.44 kg [9.8 LB] (APPROX).
3. ⊕ DENOTES CENTER OF GRAVITY (APPROX).
4. LENGTH OF RT WITHOUT BATTERY CASE.
5. INPUT POWER REQUIREMENTS: 12.5 ± 2.5 V DC, 2.5 AMP MAX.

CONNECTOR INFORMATION:

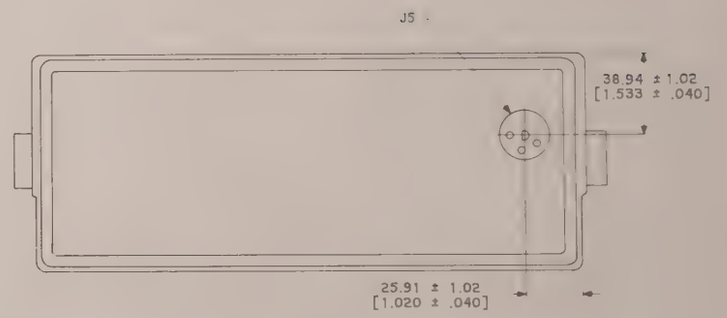
CONN	TYPE NO	PART NO	MATING TYPE	PART NO
J1	U-318/U	371-0520-010	U-316/U, U-317/U	
J2	RF-0162/W	357-7506-010		
J3, J4	U-183/U	372-2180-000	U-229/U	369-0104-010
J5	SM-C-447075	371-0521-010		
P3	U-317/U	371-0520-020	U-318/U	371-0520-010



FRONT VIEW


BATTERY BOX, CY-2562/PRC-25, WILL ACCOMMODATE BATTERIES; BA-5598/U, BA-5386/U, BA-386/PRC-25, OR BA-4386/U
RETRACTABLE HANDLE, 2 PL
48.26 [1.900] APPROX
119.38 [4.700] W/O BAT CASE
124.46 [4.900] W BAT CASE
217.47 ± 1.98 [8.562 ± .078] NOTE 4
266.78 ± 3 [10.503 ± .118]

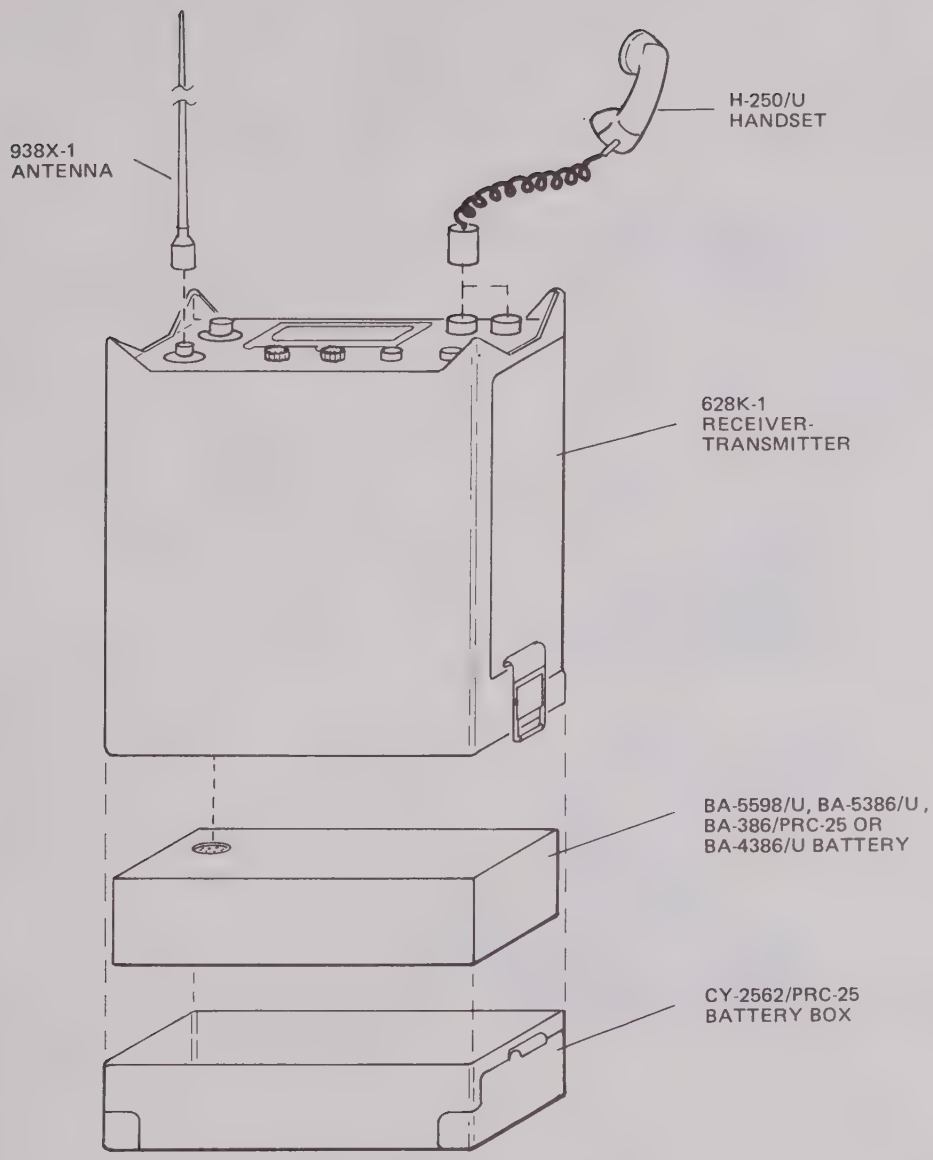
SIDE VIEW



REAR VIEW
(WITH BATTERY CASE REMOVED)

TPA-6246-014

Outline and Mounting Dimensions
Figure 2-1



Man-Pack Installation
Figure 2-2

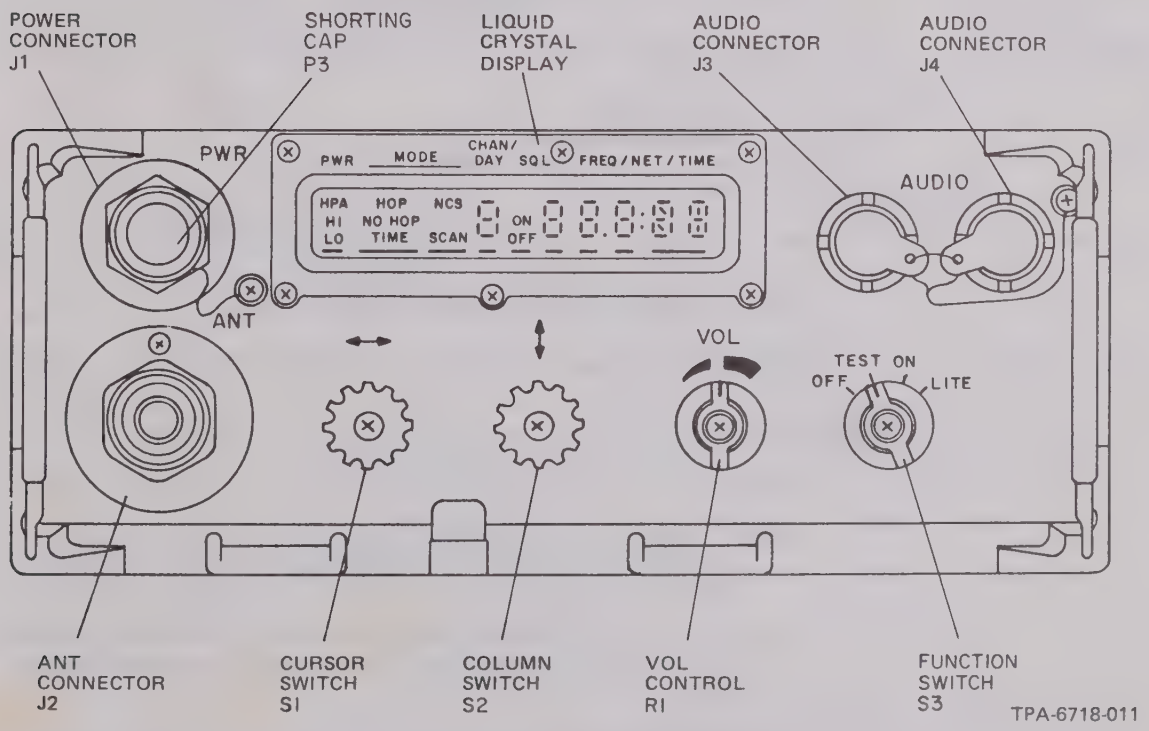
section 3
operation

3.1 GENERAL

Operation of the 628K-1 Receiver-Transmitter is controlled by the front-panel controls and indicators. Connectors on the front panel provide the necessary interface for receiver-transmitter operation.

3.2 CONTROLS, INDICATORS, AND CONNECTORS

The functions of the controls, indicators, and connectors on the receiver-transmitter front panel are described in table 3-1. Figure 3-1 illustrates the location of the controls, indicators, and connectors.



Controls, Indicators, and Connectors
Figure 3-1

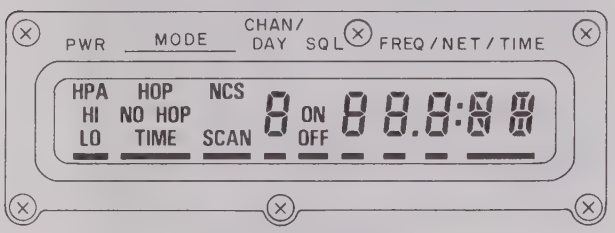
Table 3-1. Controls, Indicators, and Connectors.

CONTROL, INDICATOR, OR CONNECTOR	FUNCTION
PWR connector J1	Provides the power interface for the receiver-transmitter and the audio interface for intercom systems when installed in a vehicle. Also provides data interface for 16 kb/s data.
Shorting cap P3	Straps battery-pack power into the receiver-transmitter. Must be attached in the man-pack configuration.
Liquid crystal display	Displays PWR, MODE, CHAN/DAY, SQL, and FREQ/NET/TIME with function switch in ON position, and fault information when function switch is in TEST position. Display batteries and receiver-transmitter faults in the NO HOP, HOP, and TIME modes.
AUDIO	
Connector J3	Five-pin connector for interfacing audio external device. Provides transmit audio in, receive audio out, retransmit, and push-to-talk (ptt) key lines.
Connector J4	Provides parallel connection to above audio connector.
Function switch S3	Permits the operator to select one of the following functions OFF — removes power TEST — initiates built-in test ON — applies power for normal operation LITE — illuminates display
VOL control R1	Permits the operator to set the audio output for the most desirable listening level.
Cursor switch S1 ↔	Permits the operator to move the cursor on the liquid crystal display under the function or digit (PWR, MODE, CHAN/DAY, SQL, or FREQ/NET/TIME) that requires change.
Column switch S2 ↕	Permits operator to change the following functions in each column of the liquid crystal display: PWR: HPA, HI, or LO. HPA is used only in the vehicular configuration. CHAN/DAY CHAN: 1 through 9, CHAN is automatically displayed when HOP or NO HOP is selected. CHAN 0 is used for special functions (refer to operating procedures, paragraph 3.3.4.2.2). DAY: 1 through 7, DAY is automatically displayed when the TIME mode is selected. DAY 0 is used for special functions (refer to operating procedures, paragraph 3.3.7.1). SQL: Either ON or OFF FREQ/NET/TIME: 30.000 through 87.975 when NO HOP is selected. 000 through 799 when HOP is selected. 00:00 through 23:59 when TIME is selected.
ANT connector J2	Rf input/output connector, for direct mounting of man-pack antenna or for connecting coaxial cable.

3.3 OPERATING PROCEDURES

3.3.1 Built-In Test (BIT)

a. Set function switch to TEST.
b. Display shows all segments of the LCD for 3 seconds, refer to figure 3-2.



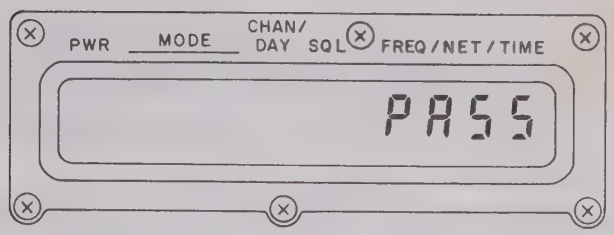
TPA-6166-011

Test Display
Figure 3-2

c. If the receiver is operating properly, the word PASS will be displayed immediately following the 3-second period, refer to figure 3-3.

Note

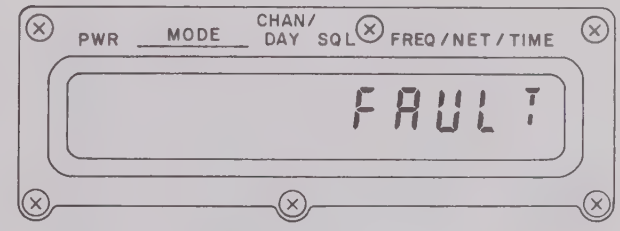
Information on the left-hand portion of the display is not relevant to the built-in test (BIT) but is merely information retained by the memory of the receiver-transmitter.



TPA-6323-011

Receive Pass Display
Figure 3-3

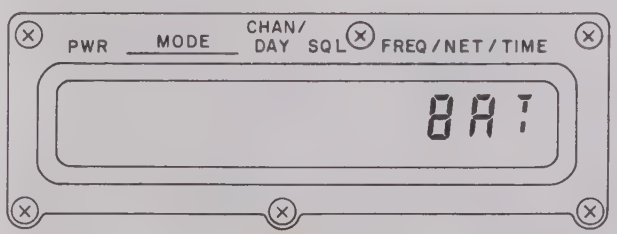
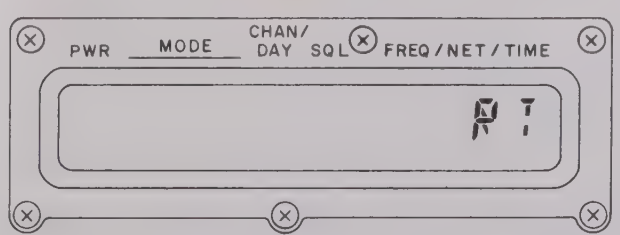
d. If a fault is detected, the LCD will display FAULT alternately with the indicated fault (example: FAULT, BAT, FAULT.....). Refer to figure 3-4 and table 3-2.



TPA-6322-011

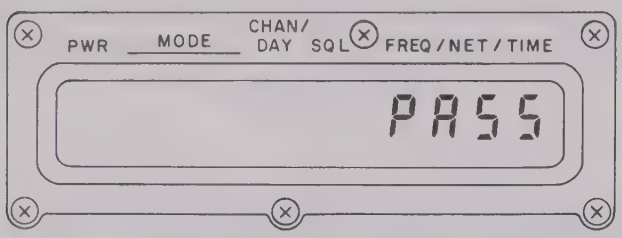
Receive Fault Display
Figure 3-4

Table 3-2. Fault Abbreviations for Receive.

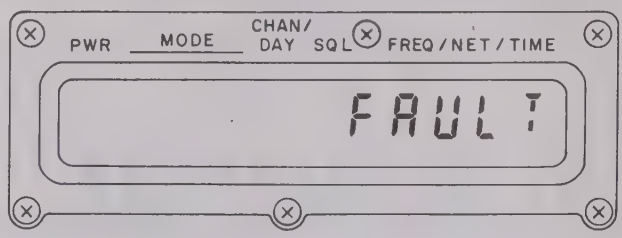
DISPLAY	FAULT CONDITION	ACTION
 TPA-6321-011	Battery voltage is less than 10 V dc.	Replace battery.
 TPA-6320-011	Receiver-transmitter is inoperative.	Return for repair.

e. If the push-to-talk (ptt) button on the handset is pressed while in the test mode, the transmit section will be checked. The LCD will display the word PASS if no fault is detected, refer to figure 3-5.

f. If a fault is detected, the LCD will display FAULT alternately with the indicated fault (example: FAULT, RT, FAULT.....). Refer to figure 3-6 and table 3-3.

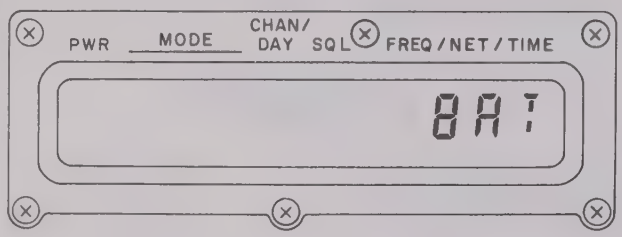
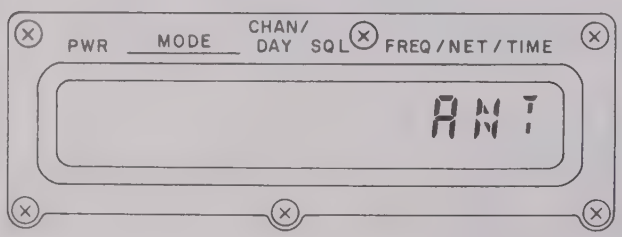
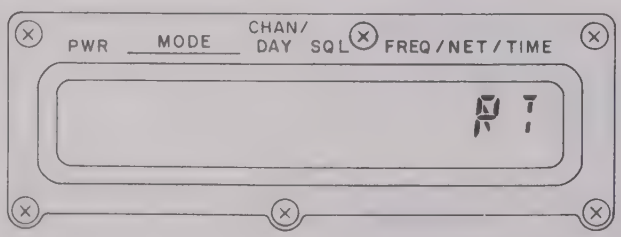


Transmit Pass Display
Figure 3-5



Transmit Fault Display
Figure 3-6

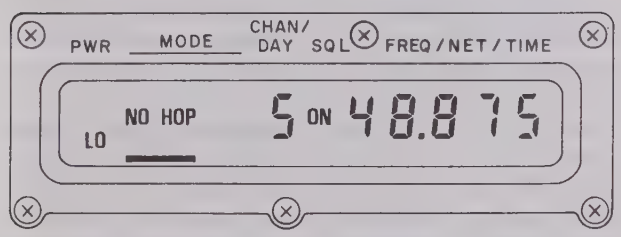
Table 3-3. Fault Abbreviations for Transmit.

DISPLAY	FAULT CONDITION	ACTION
	Battery voltage is less than 10 V dc.	Replace battery.
	Antenna performance has been degraded.	Check physical condition of antenna.
	Receiver-transmitter is inoperative.	Return for repair.

Note

Functions called out in the procedures are selected by using the cursor and column switches. To select a function to be changed, first rotate the cursor switch (↔) to position the cursor under the desired function, either PWR, MODE, CHAN/DAY, SQL, or FREQ/NET/TIME. Once the cursor is positioned under the desired function, rotate the column switch (↕) to select the desired operation under that function. An example would be to first rotate the cursor switch to position the cursor under the PWR function and to then rotate the column switch to select either HI or LO power.

3.3.2 Fixed Frequency (NO HOP)



No Hop Display
Figure 3-7

a. Set function switch to ON.
b. Set PWR to LO.
c. Select NO HOP mode.
d. Set SQL to ON.
e. Set CHAN to 1.
f. Use the cursor and column switches to set the desired frequency (30.000 to 87.975 MHz) in the display. This frequency is now loaded in preset channel 1. Set CHAN to 2.
g. Use the cursor and column switches to set the next desired frequency (30.000 to 87.975 MHz) for channel 2. This frequency is now loaded in preset channel 2.

To load the remaining 7 preset channels (3 through 9), first select the channel (3, 4, 5, 6, 7, 8, 9) to be loaded, then with the use of the cursor and column switches, select the desired frequency (30.000 to 87.975) for each channel as described above.

If, at a later time, a preset frequency needs to be changed, select the channel to be changed and input the new frequency by using the cursor and column switches. Preset channels are stored in memory and are not lost when the radio set is turned off.

3.3.2.1 Receive

a. Select the desired CHAN.
b. Listen to the handset for channel activity and adjust volume control as desired.

3.3.2.2 Transmit

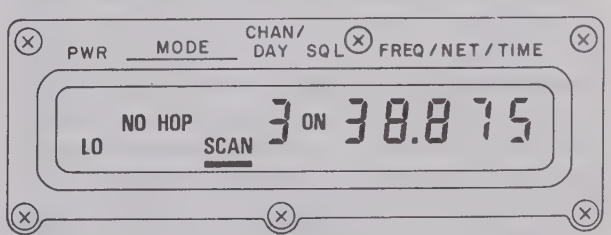
a. Press the push-to-talk (ptt) button on the handset.
b. Talk in a normal volume with mouth touching handset.
c. Release push-to-talk (ptt) button when message is complete.

When communicating with MP-83 Radio Sets or other vhf-FM-type radio sets having a 150-Hz tone squelch, the SQL should be set to ON. This eliminates the loud noise in the handset when no station is being received. If communication is required between the MP-83 Radio Set and a radio set that does not have a 150-Hz tone squelch, the SQL should be set to OFF.

PWR should be set to LO for short-range (less than 1 km (0.62 mi)) communications. Set PWR to HI for maximum range (8 km (4.97 mi)) communication. Maximum battery life is obtained when PWR is set to LO.

If the operator wishes to manually select an operating frequency, position the cursor under each digit and alter accordingly with the column switch. It should be noted that any alteration of a particular frequency changes the preset frequency of that channel. Therefore, it is suggested that a list of the preset channels be kept by the operator in case an alteration of the preset frequencies is required.

3.3.3 Channel Scanning (SCAN)



Channel Scanning (SCAN) Display
Figure 3-8

a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select NO HOP mode.
d. Verify that preset channels 7, 8, and 9 are loaded with the desired channel frequencies.

Note

SQL is automatically set to ON when the SCAN mode is selected.

e. Select CHAN for the desired preset command (primary operating) channel (1 through 9).
f. Select SCAN mode.

In the SCAN mode, the selected preset command channel, along with preset channels 7, 8, and 9, is scanned. When a signal is received, the receiver will lock on that station and remain until 3 seconds after the station stops transmitting, then resume scanning. During reception on a preset other than the command channel, the receiver continues to automatically monitor the command channel. Should activity be detected on the command channel while receiving on a different preset channel, a beep tone will be heard in the operator's handset once every second. To listen to the command channel, the operator must abort reception on the other preset channel by pressing and releasing the push-to-talk (ptt) button on the handset. SCAN will then retune his radio set to the command channel in the receive mode.

The operator may respond to a preset channel (7, 8, 9) by pressing the push-to-talk (ptt) button on the handset within 3 seconds after receiving a message. After transmission, the radio will resume scanning.

The operator may transmit on the command channel at any time while in the SCAN mode. Any time the receiver is scanning or receiving a message with no beeping tone, pressing the push-to-talk (ptt) button on the handset will cause a transmission on the command channel. If the receiver is within the 3-second timeout or receiving a channel with a beeping tone, a second pressing of the push-to-talk (ptt) button on the handset is required to cause transmission on the command channel. All transmissions on the command channel are preceded with a sidetone beep in the headset. Any change of the display cursor or column switches will abort SCAN and return the display to the command channel selected prior to SCAN.

By loading the same frequency in more than one preset channel, it is possible to reduce the number of channels (frequencies) scanned.

3.3.4 Frequency Hopping (HOP)

3.3.4.1 General

Operation of the 628K-1 Receiver-Transmitter in frequency hopping (HOP) mode requires the use of net identifiers which are similar to disciplines typically exercised in military communication nets. The net may consist of two or more members, one of which is designated the net controller. The net controller has responsibility for establishing and controlling the communications nets. The procedures of setting up a fixed frequency (NO HOP) net are the same with the 628K-1 Receiver-Transmitter as they are with any family of fixed frequency radio sets, such as the RT-841/PRC-77 Receiver-Transmitter and the VRC series of equipment. The net controller has the added responsibility of establishing and maintaining net time for the frequency hopping (HOP) net. In a fixed frequency (NO HOP) net, all radios must be set up to operate on the same frequency. In a frequency hopping (HOP) net, all radios must be set up to operate with the same frequency hopping pattern and with the same time reference. The frequency hopping (HOP) pattern is determined by the net identifier and key number. The time reference is the time maintained in each radio by the internal clock.

The procedures for loading net identifiers and loading the key number are given in paragraphs 3.3.4.2.1 and 3.3.4.2.2. The net controller is responsible for coordinating the setting of all radio set internal clocks to a common time (net time). Two techniques for setting time in a radio set are available; one is a manual time loading similar to setting a watch, paragraph 3.3.4.2.3, and the other is a procedure for transferring time from one radio set to one or more radio sets through a radio transmission, paragraphs 3.3.7.1.1 and 3.3.7.1.2.

The net controller may use one or a combination of both time entry techniques to set time in his radio set and to set the same time in all the radio sets that are to be members of the frequency hopping net. (Note: If manual time setting is used, an accuracy of ±10 seconds must be achieved.)

After a frequency hopping net is set up, the net controller must maintain time within the net so that net members will not lose the ability to communicate in the net due to the internal clock of the radio set

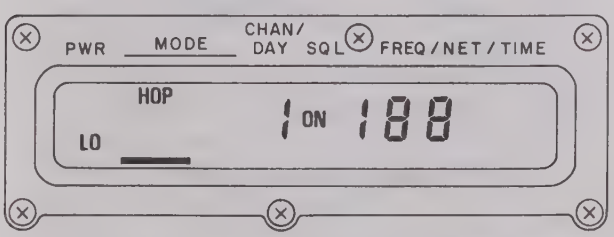
operating too fast or too slow and developing a time error in excess of ±10 seconds. The net controller will maintain time throughout the net by setting his radio set in the net control station (NCS) mode, paragraph 3.3.5. (NCS mode can only be selected in HOP mode.) Each time the net controller transmits a message, all receivers receiving that message will automatically receive a time update, resetting their internal clocks. No other action is required to maintain net time.

A non-net member may contact the net controller of the hopping net by transmitting on the fixed frequency, which is the assigned PAGE frequency of the hopping net. An alert signal will be provided to the net controller in the hopping net and, by switching from HOP mode to NO HOP mode, the net controller can communicate with the non-net member on the page frequency. A non-net member equipped with a 628K-1 Receiver-Transmitter may request a radio-to-radio time transfer, load the proper net identifier and key number, and join the hopping net.

3.3.4.2 Preset Channel Setting for Frequency Hopping (HOP)

Before 628K-1 Receiver-Transmitters can communicate with each other in the HOP mode, all radio sets must be set up with a common 3-digit net identifier, a common 4-digit key number, and common time (within ±10 seconds).

3.3.4.2.1 Setting Net Identifier



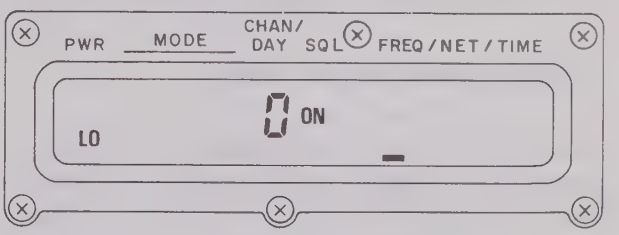
TPA-6236-011

Frequency Hopping (HOP) Display
Figure 3-9

a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select HOP mode.
d. Set CHAN to 1.
e. Using the cursor and column switches, select the net identifier (000 to 799) for channel 1.
f. Set CHAN to 2.
g. Using the cursor and column switches, select the net identifier (000 to 799) for channel 2.

To load the remaining 7 channels (3 through 9), first select the channel (3, 4, 5, 6, 7, 8, 9) to be preset, then by using the cursor and column switches, select the net identifier (000 to 799) for each channel. Load page frequency assigned to each hopping net identifier, if so desired, in the associated fixed frequency preset channel. Follow procedures for no hop, paragraph 3.3.2.

3.3.4.2.2 Key Number Loading



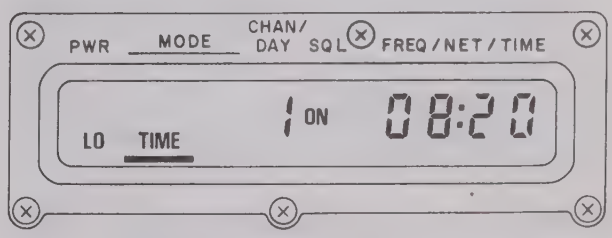
TPA-6747-011

Key Number Loading Display
Figure 3-10

a. Set CHAN to 0. No digits will be displayed on the liquid crystal display when channel 0 is first selected.
b. Rotate the cursor and column switches to set the key number (0000 to 9999).

The key number loaded is common for all preset channels (1 through 9). Should it be necessary to change the key number, set CHAN to 0 and, by using the cursor and column switches, load the new key number.

3.3.4.2.3 Manual Time Loading



TPA-6316-011

Manual Time Loading Display
Figure 3-11

a. Select TIME mode.
b. Set DAY (1 through 7).
c. Set hour (00 through 23).
d. Set minute (00 through 59) to within 1 minute of desired time.
e. As the time source starts a new minute, rotate the column switch to set the new minute on the radio set. Seconds are reset to 00 automatically every time the minute number changes.
f. Time is now entered in the radio set.

The time source will be designated by the net control station (NCS). For automatic transfer of time, use procedure for TIME, paragraph 3.3.7.

3.3.5 Net Control Station (NCS)

One station within each frequency hopping net is designated net control station (NCS) and must have NCS mode selected. The NCS has the responsibility of establishing, maintaining, and controlling the net.

To establish a net, the NCS may either designate a time source to be manually loaded into the net radio sets, paragraph 3.3.4.2.3, or use the TIME procedure, paragraph 3.3.7, to automatically transfer NCS time into the net radio sets.

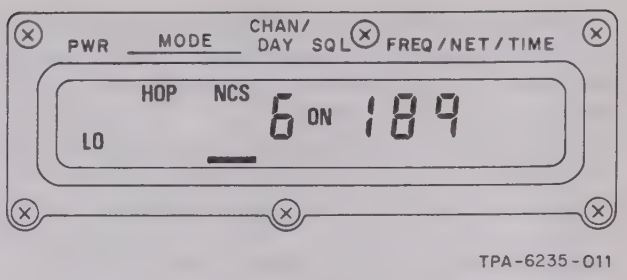
To maintain net time, the NCS must communicate with the net periodically. All non-NCS radio sets will automatically have their time updated after receiving normal communication from the NCS.

Note

Net time may be maintained for 48 hours without NCS update.

To control the net, the NCS is the only radio set having the capability to recognize PAGE messages received from non-hopping radio sets. Refer to the NCS radio set receiving PAGE procedures in paragraph 3.3.6.2. If late net entry is requested, the NCS has the option of bringing the requester into the net using TIME procedures, paragraph 3.3.7.

If NCS receives a transmission from another NCS, a "beep" will precede the message to alert the NCS operator. The time in either radio set will not be updated or altered.



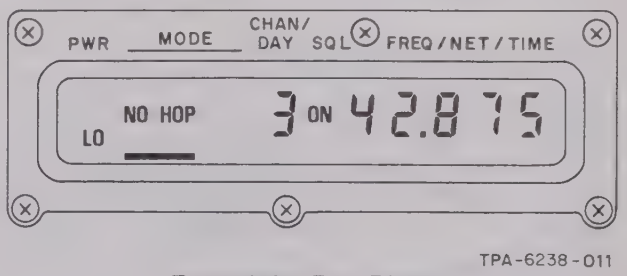
Net Control Station (NCS) Display
Figure 3-12

a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select HOP mode.
d. Select CHAN 0.
e. Select NCS mode.
f. Select preset channel (1 through 9).
g. Proceed with normal voice communication by pressing the push-to-talk (ptt) button on the handset to transmit, and releasing the button to receive.

3.3.6 Paging a Net Control Station Radio Set (PAGE)

Paging is used by a radio set in NO HOP to request communications with the net control station (NCS) of a hopping net.

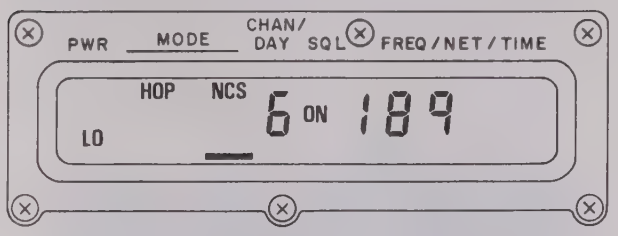
3.3.6.1 Transmitting PAGE



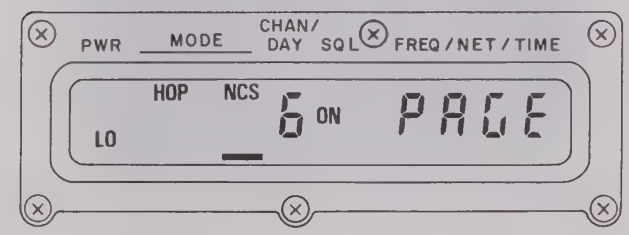
Transmitting Page Display
Figure 3-13

a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select NO HOP mode.
d. Select preassigned page channel.
e. Set SQL to ON or OFF.
f. Press push-to-talk (ptt) button on handset for approximately 3 seconds to initiate paging.
g. Voice communication is not necessary. Allow time for NCS or designated net member to respond in NO HOP mode. If late net entry is desired, follow procedure of time requester, paragraph 3.3.7.1.2.

3.3.6.2 Net Control Station (NCS) Receiving PAGE



TPA-6235-011



TPA-6239-011

Net Control Station (NCS) Receiving Page Display
Figure 3-14

The word PAGE is observed flashing alternately with the net identification number on the LCD. A beeping tone (2 kHz) cycles every 12 seconds if SQL is ON.

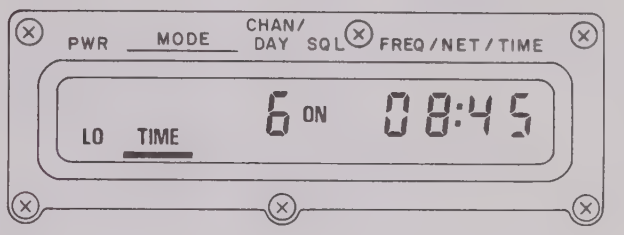
a. Select the NO HOP mode to communicate with other operator on page channel.
b. If late net entry is desired by pager, follow TIME procedure of Radio Set Transmitting Time, paragraph 3.3.7.1.1.
c. To remove tone, set SQL to OFF. The word PAGE will continue to flash as long as paging activity persists. Pressing the push-to-talk (ptt) button on the handset overrides the PAGE indication while transmitting.

3.3.7 Time (TIME)

3.3.7.1 Time Transfer

Transfer of time in this mode requires that both the radio set sending time and the radio set or radio sets receiving time must first be set up to operate on the same frequency in NO HOP mode and then switched to TIME mode. This coordination may be accomplished using fixed frequency communication or any other available signaling techniques.

3.3.7.1.1 Receiver-Transmitter Transmitting Time



TPA-6237-011

Receiver-Transmitter Transmitting Time Display
Figure 3-15

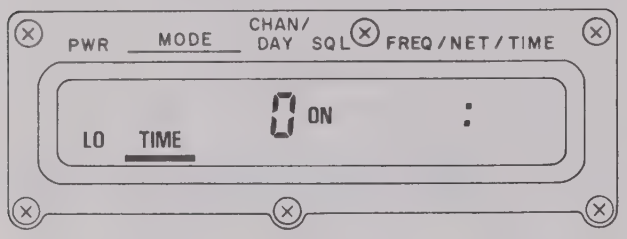
a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select NO HOP mode.
d. Set to preassigned page frequency.
e. Establish voice communication with time requester or coordinate by any available means.
f. Select TIME mode.

Note

When unit is in TIME mode, it will receive TIME mode transmissions only, and not HOP or NO HOP mode communications.

g. Transmit a message to time requester. Time is automatically updated in the requester's radio set at the end of transmission.
h. Continue voice communication in TIME mode to confirm time was received and coordinate switching to HOP mode.
i. Select HOP mode.
j. Proceed with normal voice communication by pressing the push-to-talk (ptt) button on the handset to transmit, and releasing the button to receive.

3.3.7.1.2 Receiver-Transmitter Requesting/ Receiving Time



TPA-6317-011

Receiver-Transmitter Requesting/Receiving Time Display
Figure 3-16

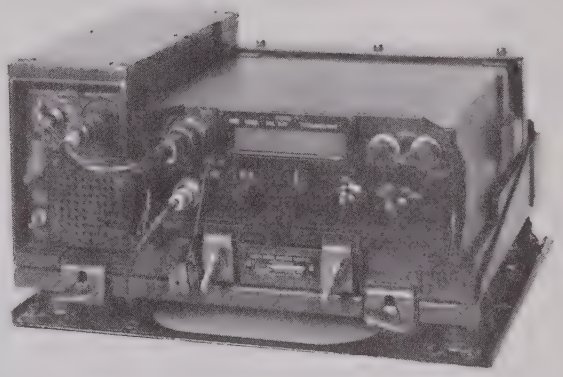
a. Set function switch to ON.
b. Set PWR to HPA, HI, or LO.
c. Select NO HOP mode.
d. Set to preassigned page frequency.
e. Establish voice communication with another operator and request time update or coordinate by any other means.
f. Select TIME mode.
g. Set DAY to 0. Time display will be blank except for colon.
h. Proceed with voice communication. The radio set will be updated at the beginning of the time transmitter's transmission, but time will not be displayed until the end of his transmission.
i. Acknowledge to transmitter that time has been received and coordinate switching to HOP mode.

Note

Continued two-way voice communication is possible without changing time in either radio set.

j. Select HOP mode.
k. Proceed with normal voice communication by pressing the push-to-talk (ptt) button on the handset to transmit, and releasing the button to receive.

3.3.8 628K-1 Receiver-Transmitter Operation in the AM-2060/GRC Amplifier-Power Supply



TPA-6265-017

628K-1 Receiver-Transmitter Installed With AM-2060/GRC Amplifier-Power Supply
Figure 3-17

a. Set PWR switch on amplifier-power supply to ON.
b. Set SPKR switch on amplifier-power supply to ON, if loudspeaker is desired.
c. Set function switch on receiver-transmitter to ON.
d. If applicable, set ANT FREQ CONTROL switch to the desired bandwidth required for fixed frequency or frequency hopping operation. Refer to the following notes.

Note

A broadband vehicular antenna (938W-1 Vehicular Broadband Antenna) may be used, thus permitting full-band frequency hopping for the radio set. When a broadband vehicular antenna is used, the ANT FREQ CONTROL switch on the AM-2060/GRC Amplifier-Power Supply is nonoperational.

Note

When an AS-1729 Antenna is used, narrowband hopping net operation is possible. Refer to the frequency plan to determine the proper bandwidth, then set ANT FREQ CONTROL switch on the AM-2060/GRC Amplifier-Power Supply to the applicable bandwidth.

Proceed with normal voice communication by pressing the push-to-talk (ptt) button on the handset to transmit and releasing the button to receive.

Note

High-power output of the receiver-transmitter is automatically limited to 2.5 W due to limitations in the amplifier-power supply.

3.3.9 MP-83 Radio Set Radio Relay Using Electrical Cable Assembly CX-4656/GRC

Two MP-83 Radio Sets may be configured as a radio relay station to extend the communication range of radios using the relay. The relay link is accomplished by an rf link (F1) between radio sets no 1 and no 2, a baseband frequency link between radio sets no 2 and no 3, and an rf link (F2) between radio sets no 3 and no 4. The relay may be used by radios in either the NO HOP, HOP, or TIME mode; however, NCS update in the HOP mode or automatic time transfer in the TIME mode is not provided between radio sets no 1 and no 4. Any combination of modes may be used providing that the radio sets interfacing with the rf links, F1 and F2, are using common modes. For example, radio sets no 1 and no 2 may be operating in the NO-HOP mode while radio sets no 3 and no 4 are operating in the HOP mode.

To minimize interference at the relay site, the requirements for selecting the two rf links, F1 and F2, are as follows:

- F1 and F2 must be separated by a frequency band that is equal to or greater than 10% of the highest frequency of the two.
- Either F1 or F2 must not be double the frequency of the other.
- Either F1 or F2 must not equal the other plus 13.5 MHz.
- Either F1 or F2 must not equal the other plus 27.0 MHz.

To summarize:

- For F1 > F2, F1 $\geq$ 10% F1 + F2
  For F2 > F1, F2 $\geq$ 10% F2 + F1
- F1 <> 2F2, F2 <> 2F1
- F1 <> F2 + 13.5 MHz, F2 <> F1 + 13.5 MHz
- F1 <> F2 + 27.0 MHz, F2 <> F1 + 27.0 MHz

To establish initial relay link, use the following procedures.

On radio sets no 1, no 2, no 3, no 4:

a. Set function switch to ON.
b. Set PWR to HI.
c. Select NO HOP or HOP mode.
d. Set SQL to ON.

On radio sets no 1 and no 2:

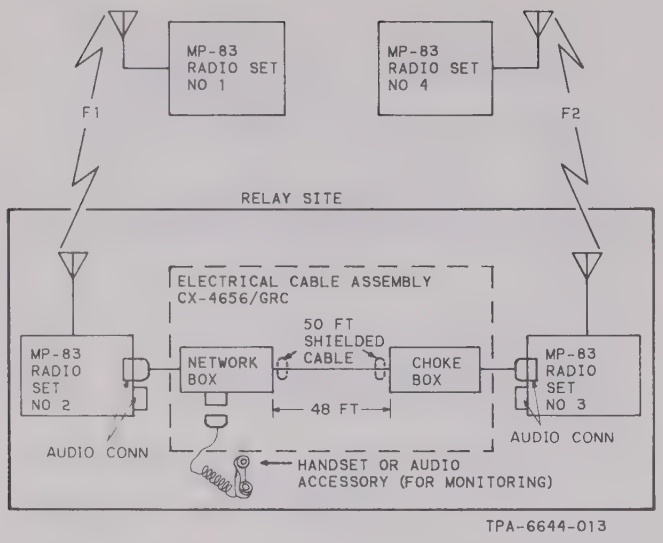
e. Set CHAN to desired operating channel/net (F1).
f. Establish voice communication between radio sets and verify that squelch is satisfactory.
g. Advise radio set no 1 to stand by.

On radio sets no 3 and no 4:

h. Set CHAN to desired operating channel/net (F2).
i. Establish voice communication between radio sets and verify that squelch is satisfactory.
j. Advise radio set no 4 to stand by.

On radio sets no 2 and no 3:

k. Connect the connectors on each end of the Electrical Cable Assembly CX-4656/GRC to the AUDIO connector on radio sets no 2 and no 3 as shown in figure 3-18.



Radio Relay Using Electrical Cable Assembly CX-4656/GRC
Figure 3-18

Establish communication between radio sets no 1 and no 2 and advise radio set no 1 that the relay site is prepared for communication with radio set no 4.

Note

To communicate with radio set no 1 or no 4, the operator at the relay site must have a handset connected to the spare AUDIO connector on the relay site radio associated with the distant radio set.

Establish communication between radio sets no 3 and no 4 and advise radio set no 4 that the relay site is prepared for communication with radio set no 1.

Communication proceeds automatically between radio sets no 1 and no 4 without any operation required at the relay site.

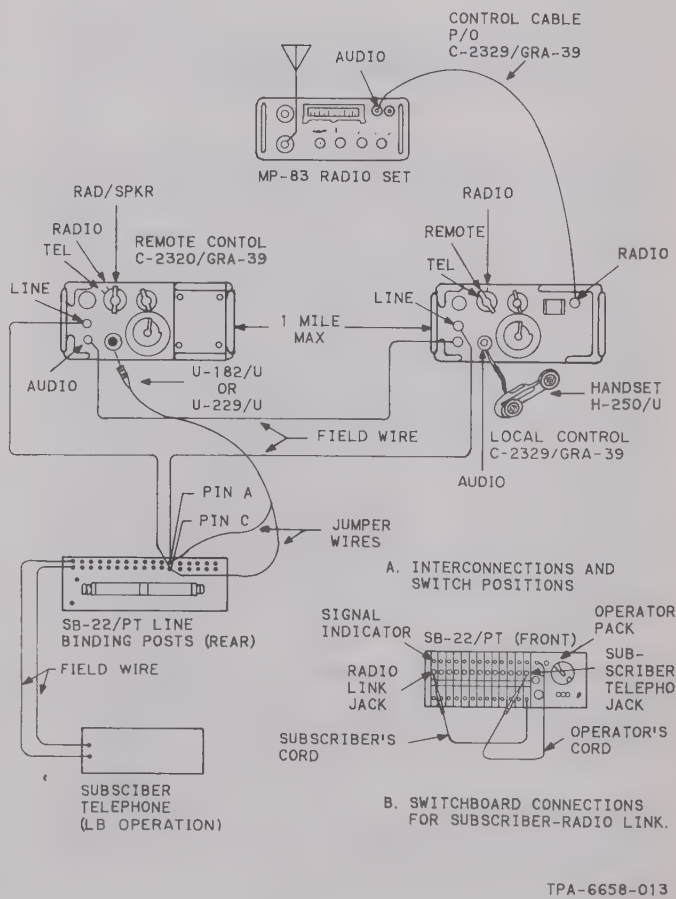
To enable the operator at the relay site to receive instructions and to monitor communications between radio sets no 1 and no 4, a handset may be connected to either of the spare AUDIO connectors on radio sets no 2 and no 3 or to the audio connector on the network box of the cable assembly.

3.3.10 MP-83 Radio Set Remote Control Using Radio Set Control AN/GRA-39

The Radio Set Control AN/GRA-39 provides remote radio set control of the transmissions and receptions of the MP-83 Radio Set for up to 3.3 km (2 mi) and also enables radio wire integration (RWI) between the Telephone Switchboard SB-22/PT and the radio set.

Operation of the MP-83 Radio Set as described in the operating procedures is unchanged. The Radio Set Control AN/GRA-39 with radio wire integration is connected as shown in figure 3-19.

Set the switches on the remote control boxes as shown in figure 3-19.



Remote Control Using Radio Set Control AN/GRA-39
Figure 3-19

Since the remote control is set up at the switchboard, the switchboard operator will respond to calls from the distant radio set with the push-to-talk (ptt) button of his handset using proper radio communication procedures. In effect, the switchboard operator becomes the radio set operator.

When the radio set's call signal is heard on the loudspeaker of the remote control, proceed as follows:

a. Insert the operator's cord into the radio set link jack and determine the desired subscriber.
b. Advise the distant radio set to stand by.
c. Connect the operator's cord to the subscriber's jack.
d. Ring and notify the subscriber of the call. (The subscriber should be reminded to ring back when the call is completed.)
e. Connect the subscriber's cord to the radio set link jack.

Note

Positioning of the switchboard handset switch to the RADIO position on the remote control while the operator's cord is connected to the subscriber's jack will key the radio set.

f. Remove the operator's cord from the subscriber's jack. The incoming radio set communication can be heard on the remote control's loudspeaker, the subscriber's voice cannot be heard. When the subscriber's signal indicator on the switchboard shows white, proceed as follows:
g. Insert the operator's cord into the subscriber's jack without operating the switchboard handset switch to the RADIO position. Question the subscriber to determine if the circuit is still required.
h. If the call is complete and the circuit is no longer required, remove the subscriber's cord from the radio set link jack.

section 4
theory

4.1 GENERAL

This section contains information describing the overall operating principles of the 628K-1 Receiver-Transmitter on a functional level. Operating principles of the circuit cards/modules are described only to the level necessary to make the overall description meaningful.

4.2 FUNCTIONAL THEORY

4.2.1 Overall Unit

The receiver-transmitter consists of six two-sided printed circuit boards. These boards are designated: display, power amplifier, synthesizer, receiver, control, and ECCM. Refer to figure 4-1, 628K-1 Receiver-Transmitter simplified block diagram, for the following discussion of the radio set.

The synthesizer contains a single-loop indirect synthesizer that operates at a frequency 13.5 MHz above the radio set receive or transmit frequency. In the receive mode, this frequency (f_0 + 13.5 MHz) is supplied to the receive mixer to translate the incoming received signal to the 13.5-MHz intermediate frequency (if). In the transmit mode, the output of the 13.5-MHz vcxo (variable-control crystal oscillator) is mixed with the synthesizer frequency (f_0 + 13.5 MHz) to provide a low-level on channel transmit signal. The vcxo is a "pullable" crystal oscillator that is used to provide the required frequency modulation.

The receiver contains a 2-band (30 to 52 MHz and 52 to 88 MHz), voltage-tuned preselector, the receive mixer (where the synthesizer frequency (f_0 + 13.5 MHz) is applied), a 13.5-MHz crystal filter, intermediate frequency (if) amplifiers, discriminator, and squelch circuitry. The preselector serves as a tuned amplifier for both receive and transmit signals. In the transmit mode, the preselector removes the spurious mixing products from the synthesizer output and provides a clean, low-noise transmit signal to the power amplifier. In the receive mode, the received signal is supplied to the preselector to remove spurious signals and is then applied to the receive mixer to produce the 13.5-MHz if. The if is then filtered, amplified, and applied to the audio circuitry and detected for 150-Hz squelch tone.

The power amplifier provides amplification of the transmit signal with ALC (automatic level control) to ensure that power levels of either 0.25 watts or 5 watts at the antenna. The power amplifier also contains a 2-band low-pass filter to suppress harmonics of the transmit signal.

The control contains the microprocessor circuitry that controls all facets of the radio set operation. This card also contains the audio processing circuitry for the radio set.

The ECCM works in conjunction with the microprocessor on the control to provide the signal processing and control functions necessary for frequency hopping electronic counter-countermeasures (ECCM) in transmit and receive.

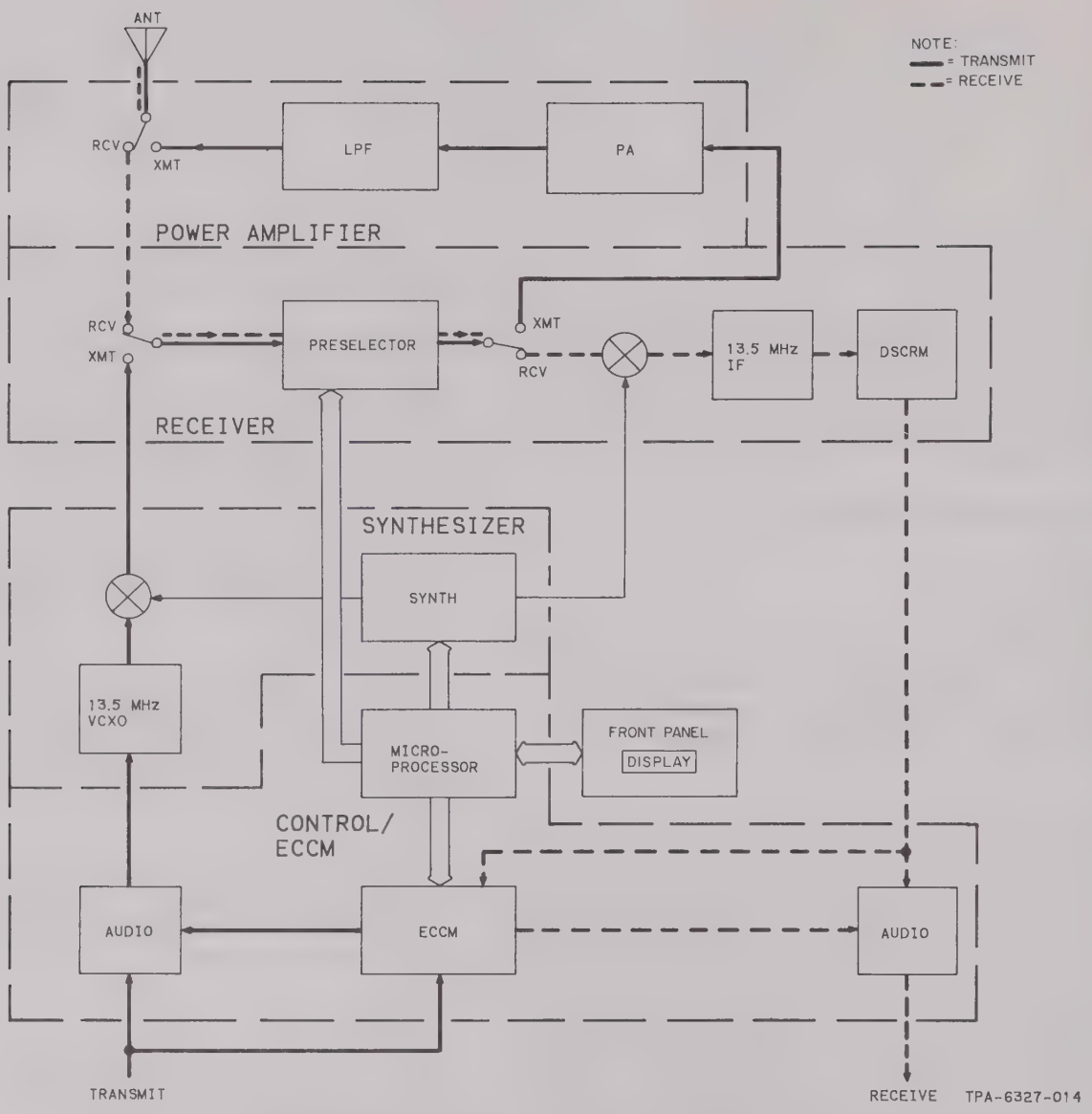
The display is a small printed circuit board containing the liquid crystal display (LCD) and its associated drive circuitry. The display is attached to the back of the front panel.

4.2.2 Receive

Refer to figure 4-2 functional block diagram, for the receive signal path. The receive signal path is represented by a heavy set dashed line.

A signal received at the antenna goes through ANT connector J2 and is applied to the power amplifier. The signal is sent through a transmit/receive switch and routed from the power amplifier to the receive.

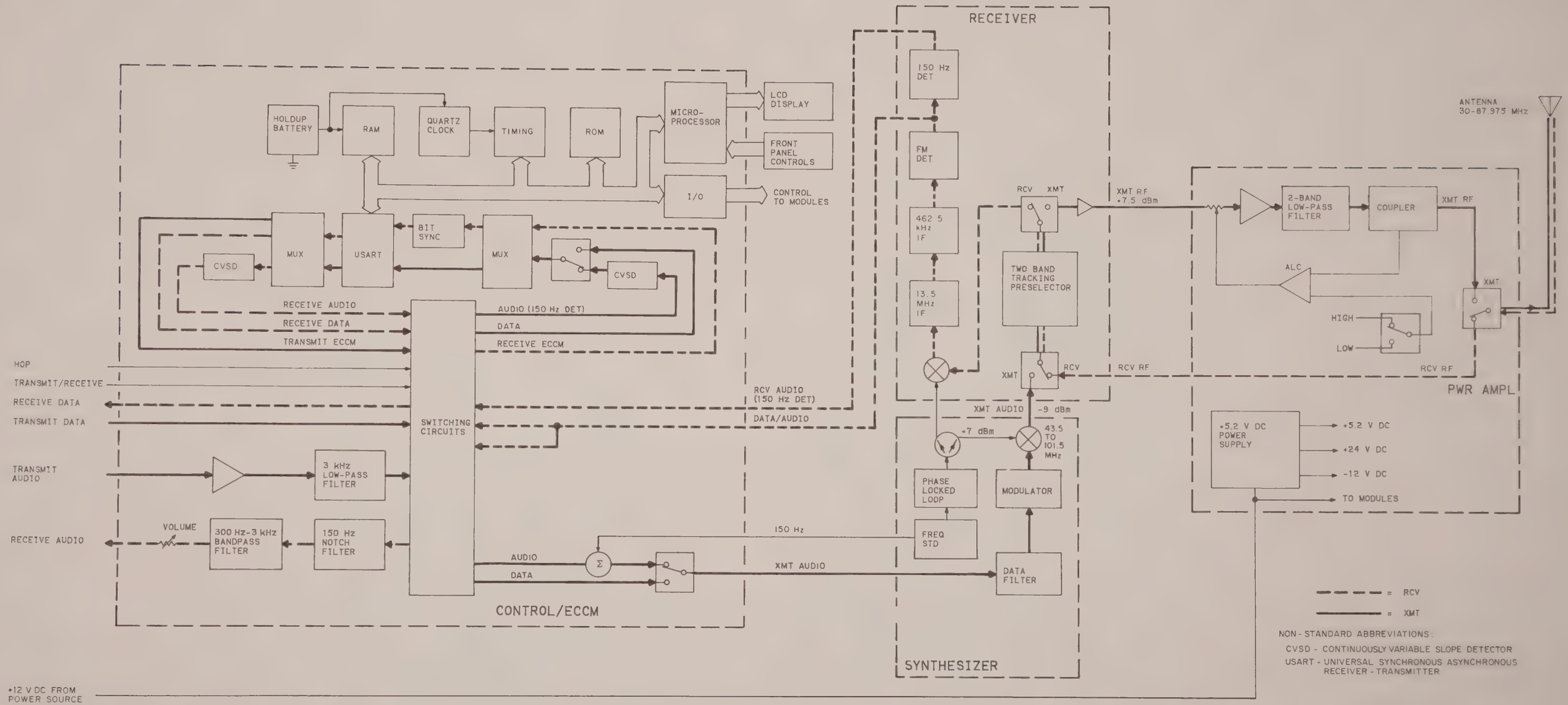
At the receiver, the signal is applied through a transmit/receive switch to the 2-band preselector. The 2-band preselector is divided into a 30- to 52-MHz filter and a 52- to 88-MHz filter. The filters consist of a 2-pole input and a 2-pole output filter with a dual gate MOSFET transistor gain stage in between filters. The filters are varactor tuned. From the preselector, the signal is applied through a transmit/receive switch to the receive mixer. At the receive mixer, the



628K-1 Receiver-Transmitter, Simplified Block Diagram
Figure 4-1

receive signal is mixed with a signal from the synthesizer that is 13.5 MHz above the receive frequency. This mixing produces the 13.5-MHz intermediate frequency (if). From the mixer, the 13.5-MHz if is applied to the 13.5-MHz if strip where close in selectivity is provided by a crystal filter at 13.5-MHz strip. Following the 13.5-MHz if strip is a 462.5-kHz if strip and FM detector. The 462.5-kHz if reduces the potential of having internally generated signals on 25-kHz channels. The FM detector provides dc coupled audio and data output to the control/ECCM module and to the 150-Hz squelch tone detector on the receiver. The output from the 150-Hz squelch tone detector is used by the voice squelch on the control/ECCM module.

Receive audio entering the control/ECCM originates at the receiver FM detector. When receiving voice, the audio is passed through a 150-Hz notch filter and then a 300-Hz high-pass and a 3000-Hz low-pass filter. A squelch gate mutes the audio when a 150-Hz squelch tone is not detected by the receiver. When receiving audio, the audio is applied through either AUDIO connector J3 or J4 to the handset. Volume



628K-1 Receiver-Transmitter, Functional Block Diagram
Figure 4-2

level control is on the front panel. When receiving 16-kb/s data, the data is supplied to PWR connector J1 on the front of the receiver-transmitter. When the radio set is in the HOP mode, the receive signal is in the form of data at 20 kb/s. This data is applied from the FM detector in the receiver to the switching circuits of the control/ECCM. The data (receive ECCM) is then applied through a multiplexer and the BIT sync to the USART (universal synchronous asynchronous receiver-transmitter) which converts the 20-kb/s data to 16-kb/s data. The 16-kb/s data is then dedigitized by passing through the CVSD (continuously variable slope detector). The dedigitized receive audio or data is then sent back to the switching circuits and applied to either AUDIO connector J3 or J4, or PWR connector J1.

4.2.3 Transmit

Refer to figure 4-2, functional block diagram, for the transmit signal path. The transmit signal path is represented by a heavy set solid line.

Transmit audio may originate at either AUDIO connectors J3 or J4, or PWR connector J1 located on the front panel of the receiver-transmitter. After appropriate gain, clipping, and low-pass filtering, the transmit audio is mixed with 150 Hz from the synthesizer. The transmit audio in the NO HOP mode is then sent to the synthesizer. In the HOP mode transmit audio is digitized by the CVSD at 16 kb/s and is then sent to the USART where, with the aid of the microprocessor, the transmit audio is bursted from 16 kb/s to 20 kb/s.

The transmit audio in NO HOP or the transmit data at 20 kb/s in HOP mode are now sent to the data filter and modulator in the synthesizer. The data filter limits the spectrum of the transmitted data and provides maximum signal strength in a 25-kHz bandwidth. The output of the data filter goes to the modulator (13.5-MHz voltage-controlled crystal oscillator (vcxo)). The vcxo is turned off in the receive mode since it oscillates on the receiver's first if frequency and if left on would cause unwanted receiver noise. The output of the modulator is fed to the transmit mixer where it is mixed with an output from the phase-locked loop.

The synthesizer transmit mixer output is then sent to the receiver. The signal passes through a transmit/receive switch and into the 2-band tracking preselector for filtering and amplification. The signal then passes through another transmit/receive switch and is applied to the power amplifier.

The rf drive signals (transmit audio) from 30- to 87.975-MHz FM modulated are supplied in the power amplifier from the synthesizer at a level of 7.5 dBm. The power amplifier has a bipolar gain stage and then a voltage-controlled pin diode attenuator at its input. This attenuator provides envelope shaping to minimize unwanted AM sidebands while transmitting in the HOP mode. Following the pin diode are two push-pull transistor gain stages. A pin diode switched 2-band low-pass filter follows the amplifiers. Pin diodes are used to switch between low-pass filters because at 104 hops per second rate relays would not have an adequate lifetime. The low-pass filters are designed for 52-MHz and 88-MHz cutoffs. Following the low-pass filter is a directional coupler and a transmit/receive switch. The two output power levels of 5 watts and 0.25 watts are controlled by the ALC in the power amplifier.

4.2.4 Microprocessor

The microprocessor on the control is an NSC800 (refer to figure 4-2). This microprocessor was chosen because of its low input power requirement (CMOS) and powerful instruction set. The microprocessor serves the dual function of controlling the receiver-transmitter and processing data in the HOP mode. The front panel cursor (↔) and column (↕) switches are monitored by the microprocessor. The microprocessor also controls the LCD, matching internal receiver-transmitter functions to what is on the LCD. The microprocessor and its associated I/O devices provide parallel frequency and mode information to the remaining modules in the receiver-transmitter.

The ECCM function is handled by a bit synchronizer, USART, and microprocessor. The bit synchronizer synchronizes the receiver clock to the received data during an alternating one-zero pattern. The USART develops character and frame synchronization and the microprocessor handles the resultant data and has an algorithm for generating and exclusive ORing a processor generated pseudorandom code with data.

The hop rate for ECCM is 104 hops per second with the dwell time on each frequency after synchronization being 8 milliseconds. The overhead time between dwells of 1.6 milliseconds is used for synthesizer settling time and power amplifier power output rise and fall times. A page frame is inserted into the frequency hopping sequence every 250 milliseconds. This page frequency is operator selectable and

programmable for each channel selected (refer to operation section for paging).

A Quartz clock within the receiver-transmitter provides the coarse time required for synchronization. The Quartz clock in the transmitter and receiver must be within 10 seconds of each other to achieve synchronization. In the event that a receiver-transmitter does not have correct time, wrist watch time may be entered on the front panel when the receiver-transmitter is in TIME mode or time can be transferred over the air from station to station in the TIME mode (refer to operation section for time setting). Once the Quartz clock is set to within 1 second, the worst case net synchronized lifetime is 48 hours.

The ECCM synchronization scheme is based upon all receiver-transmitter units saving their 1024th frames in the hopping pattern. These frames will occur approximately every 10 seconds. The hop frequency corresponding to the 1024th frame is the same for all receiver-transmitter units containing the same key number and operating on the same channel (same net identifier). All receiver-transmitter units save their last three synchronized frequencies. These correspond to the synchronized frequency now, 10 seconds ago, and 20 seconds to the synchronized frequency now, 10 seconds ago, and 20 seconds ago. When a receiver is in synchronized search, the receiver is tuned to the middle frequency (synchronized frequency 10 seconds ago). When a transmitter keys up, the preamble is sent on the three synchronized frequencies, then the three frequencies are repeated again in case the receiver was servicing page at the time it should have received the first valid synchronized frequency. Once the receiver recognizes the synchronized message, it recovers the synchronized frame, receives the transmitters exact time, and starts hopping in synchronization at 104 hops per second.

The Quartz clock is a microprocessor circuit that is kept alive when the receiver-transmitter is off by a lithium hold-up battery (HUB). The HUB also powers a CMOS RAM containing channel presets and display information. This HUB has a worst case life expectancy of 5 years at which time it must be replaced.

4.2.5 Power Distribution

Refer to figure 4-3. The +12.5 V dc applied through A1J5-B is sent through A1J1-F through shorting cap A1P3 and back out A1J1-E to function switch A1S3-3. With the function switch in the ON position, +12.5 V dc is applied through A1S3-4 to power amplifier A2J1-24 and 25. The following voltages are produced in the power amplifier: +12 V dc XMT, +24 V dc, -12 V dc, +12 V dc, -12 V dc XMT, and +5.2 V dc. These voltages, except for the -12 V dc XMT which is used only on the power amplifier, are sent through the ribbon cable and A2P1 to the control A3A1J1-24, -3, -25, -14, and -13. The +5.2-V dc voltage is then sent through A3A1P1-49 and 50 to the ECCM A3A2. All voltages are also routed through the control to A3A1J2 and are simultaneously sent to receiver A4 and synthesizer A5.

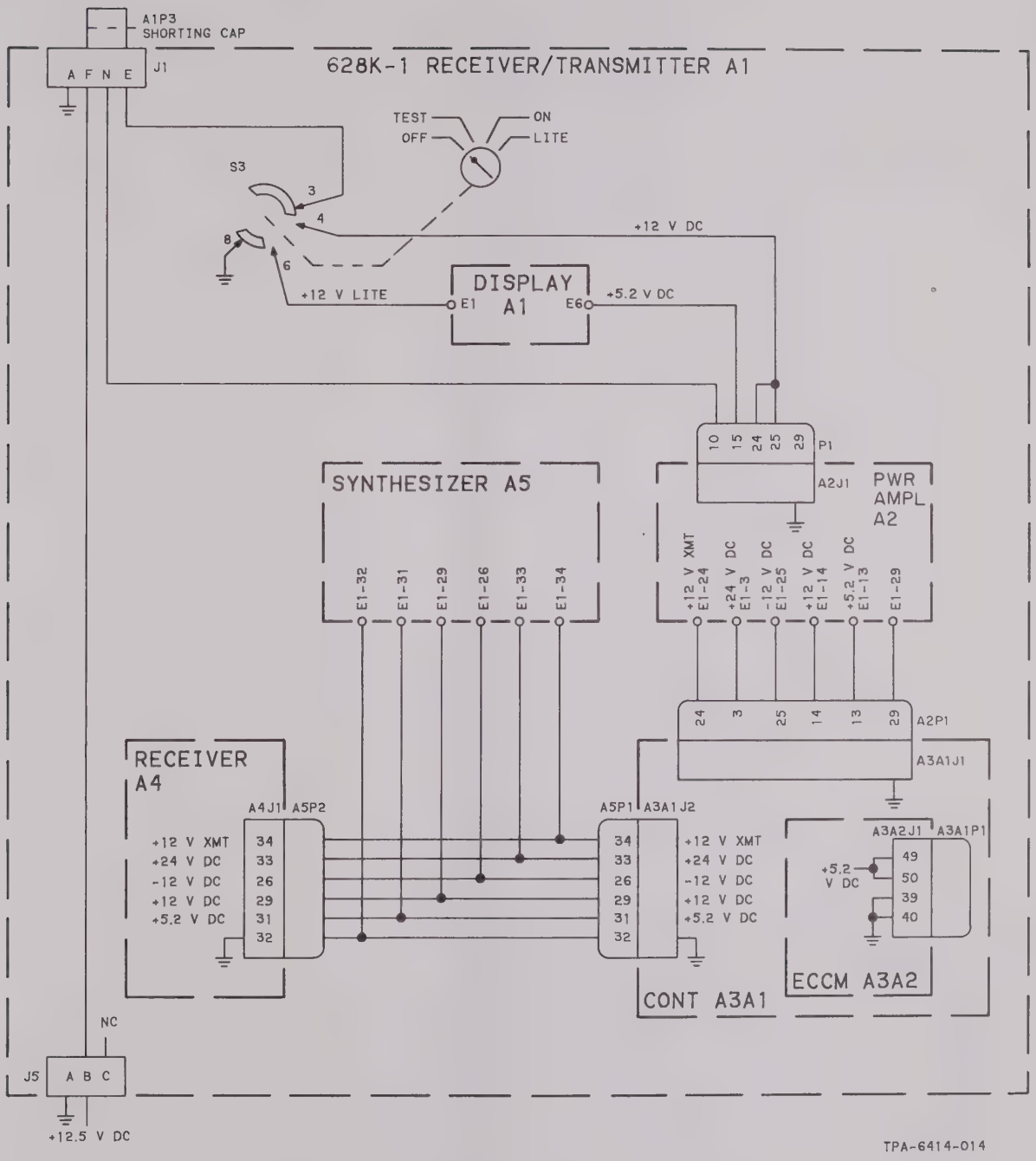
The display A1A1 is supplied with two voltags. The primary voltage is the +5.2 V dc from A1P1-15; it provides the voltage necessary for all display functions. The secondary voltage is the +12V LITE from A1S3-6. This voltage is used for illumination of the display, and is applied only when the function switch is in the LITE position.

When in the vehicular applique, power for the receiver-transmitter is applied through A1J1 and is then routed as in the above description.

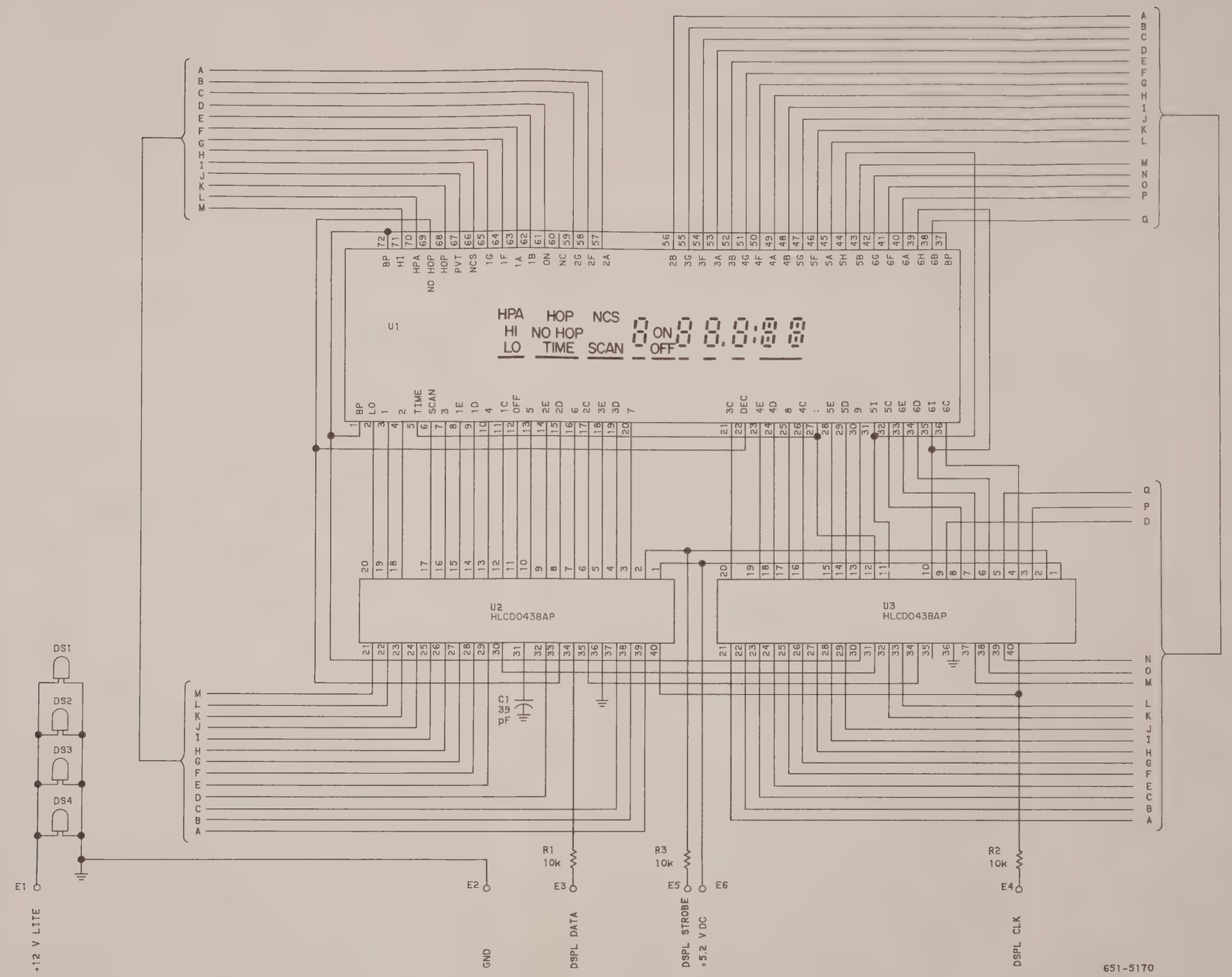
The +12 V dc is supplied to A1J1-N for external use should the need arise. It should be noted, though, that A1J1-F and E still require shorting to maintain power to the receiver-transmitter.

4.2.6 Display

The display is a small printed circuit board located directly behind the front panel and secured to the chassis. The display consists of the liquid crystal display (LCD), the associated drive circuitry (U2 and U3), and the display lighting (DS1 through DS4). Inputs to the display are through terminals E1 through E6. Refer to figure 4-4 for a schematic diagram of the display.



Power Distribution
Figure 4-3



NOTE

U1 SEGMENTED CHARACTERS ARE LABLED AS FOLLOWS:

Display Schematic Diagram
Figure 4-4

section 5
maintenance

5.1 GENERAL

This section provides instructions for testing and troubleshooting the 628K-1 Receiver-Transmitter. Testing and troubleshooting procedures provide a means to make a rapid evaluation of essential equipment operational characteristics to determine if performance is satisfactory. Should a fault occur, the procedures will aid in determining the necessary action. Individual circuit card/module instruction sections contain testing and troubleshooting procedures to isolate faults to a specific circuit or individual component.

5.2 TEST EQUIPMENT

Table 5-1 lists all test equipment required to test and troubleshoot the receiver-transmitter. If the specified test equipment is not available, equivalent items may be substituted.

Table 5-1. Test Equipment.

ITEM	MINIMUM SPECIFICATION	REPRESENTATIVE TYPE
Digital multimeter	0 to 15 V ac	Fluke 8000A
Distortion analyzer	5 Hz to 100 kHz	Tektronix AA501
Oscilloscope	Bw 60 MHz @ 5 mV/DIV, dual trace	Tektronix 465
Frequency counter	10 Hz to 80 MHz	Fluke 7260A
Signal generator	30 to 88 MHz	Hewlett-Packard 8640B
Rf wattmeter	6 W max	Hewlett-Packard 435A
50-Ω attenuator	30 dB, 5 W	
FM modulation meter	30 to 88 MHz	Boonton 8210
50-Ω attenuator (2)	60 dB, 5 W	
Power supply	+12.5 V dc, 3 A max	Sorenson 0 to 20 V dc, regulated
Test fixture		966X-1 Man-Pack Radio Set Test Set (part number* 622-6799-001)
Function generator	10 Hz to 10 kHz	Krohn-Hite 5400B

*Unless otherwise indicated, all part numbers are Rockwell-Collins.

5.3 TESTING AND TROUBLESHOOTING

5.3.1 General

The following paragraphs contain information on test setup, performance testing and troubleshooting.

The test/troubleshooting procedures in paragraph 5.3.3 determine the overall operational quality of the receiver-transmitter. These tests (tables 5-2 and 5-3) should be performed upon initial installation of the equipment, after equipment has been repaired, or at any time degradation of performance is suspected.

The minimum performance test/troubleshooting procedures in table 5-4 provide a more detailed determination of overall operational quality of the receiver-transmitter. These tests should be performed after the equipment has been repaired or in conjunction with the test procedures of paragraph 5.3.3 if degradation of performance is still suspected.

The tests may be performed in any sequence, but the steps of each test must be performed in sequence. Each test may be performed as an individual test or as part of the overall test. For any test that does not meet the requirements of the procedures in paragraph 5.3.3, follow the directions given in the ACTION column. For any test that does not meet or exceed the requirements of the NORMAL INDICATION column in table 5-4, follow the directions given in the IF INDICATION IS ABNORMAL column.

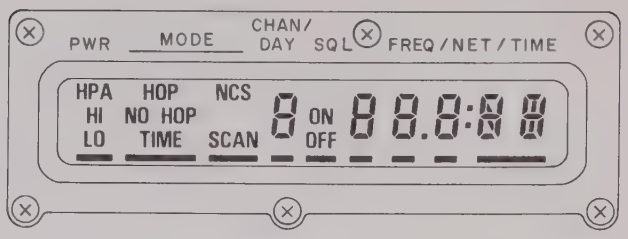
5.3.2 Test Setup

Refer to figure 5-6 for test setup. Performance of the overall receiver-transmitter check may be performed using the battery, battery box, handset, and antenna. Ensure that all components are properly secured to the receiver-transmitter and in good working order.

Do not turn on power to the receiver-transmitter until directed to do so in the procedures.

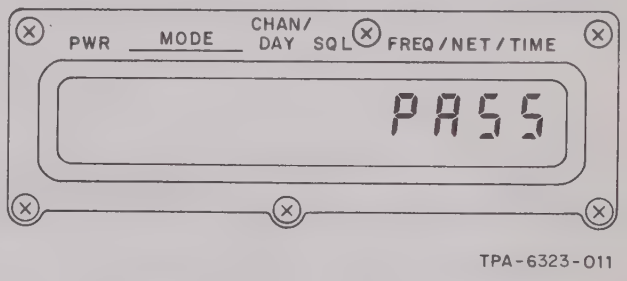
5.3.3 Receiver Transmitter Overall Check

a. Set function switch to ON.
b. Set NO HOP mode.
c. Set CHAN to 0.
d. Set function switch to TEST.
e. Display shows all segments of the LCD for 3 seconds (refer to figure 5-1). If the LCD does not display all segments, replace the display A1A1.



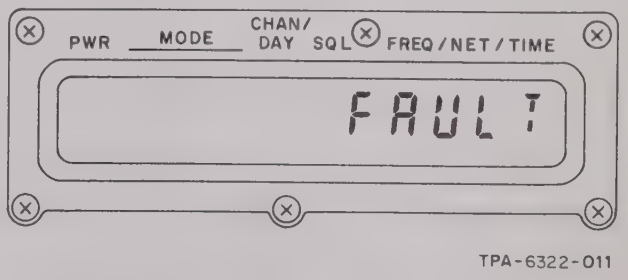
Test Display
Figure 5-1

f. If the receiver is operating properly, the word PASS (refer to figure 5-2) will be displayed immediately following the TEST display.



Receive Pass Display
Figure 5-2

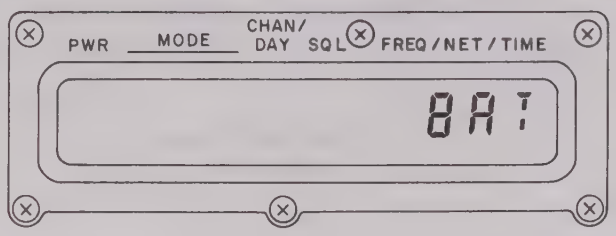
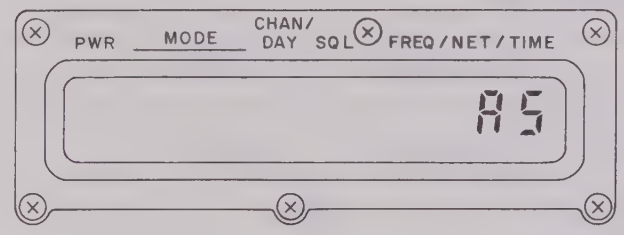
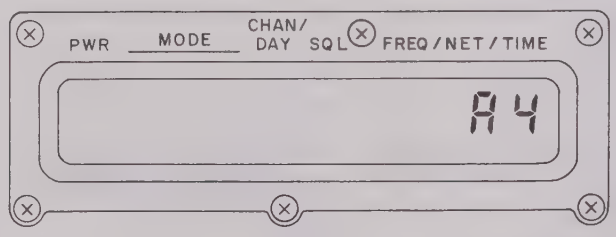
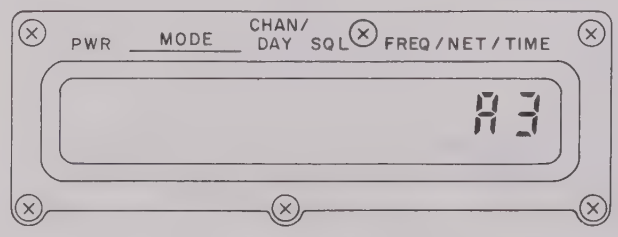
g. Should a fault be detected, the LCD will display faults by alternately flashing the word FAULT (refer to figure 5-3) and the abbreviation corresponding to the fault area, eg, FAULT, A5, FAULT.



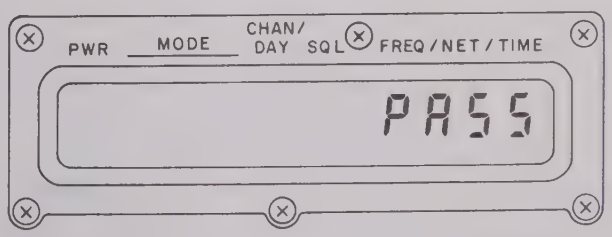
Receive Fault Display
Figure 5-3

h. Table 5-2 lists the possible faults which may be displayed as receive faults if the receiver-transmitter is inoperational.

Table 5-2. Receive Faults.

DISPLAY	FAULT CONDITION	ACTION
 TPA-6321-011	Battery voltage is less than 10 V dc	Replace battery.
 TPA-6423-011	Synthesizer has loss-of-lock	Replace A5. Refer to synthesizer section for repair of A5.
 TPA-6422-011	Receiver squelched	Replace A4. Refer to receiver section for repair of A4.
 TPA-6421-011	Control RAM pattern not read	Replace A3. Refer to receiver/ECCM section for repair of A3.

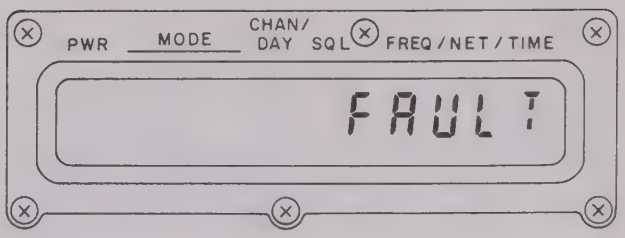
i. By pressing the push-to-talk (ptt) button on the handset, the transmit portion of the receiver-transmitter is checked. The transmitter radiates for 100 ms in order to check the transmit section. If the transmitter is operational, the word PASS (refer to figure 5-4) will be displayed on the LCD.



TPA-6323-011

Transmit Pass Display
Figure 5-4

j. Should a fault be detected, the LCD will display faults by alternately flashing the word FAULT (refer to figure 5-5) and the abbreviation corresponding to the fault area, eg, FAULT, ANT, FAULT.
k. Table 5-3 lists the possible faults which may be displayed as transit faults if the receiver-transmitter is inoperational.



Transmit Fault Display
Figure 5-5

Table 5-3. Transmit Faults.

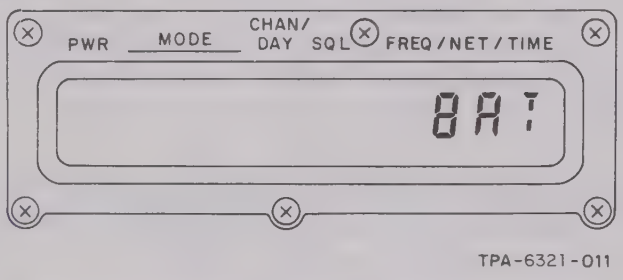
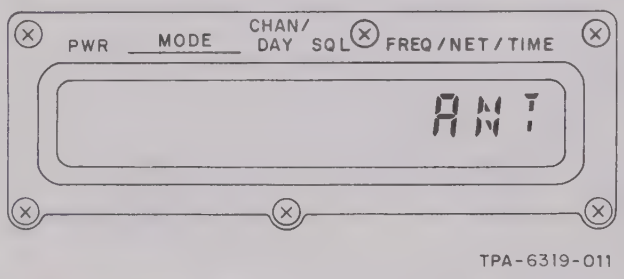
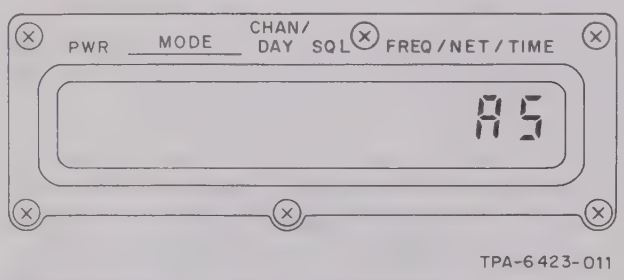
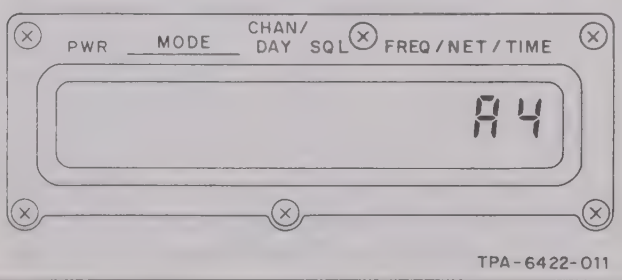
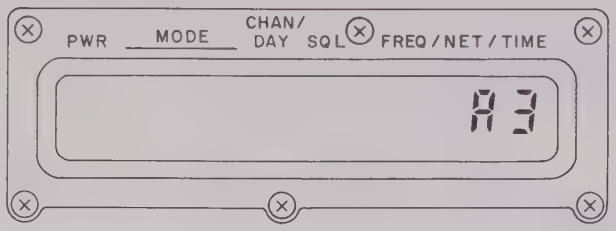
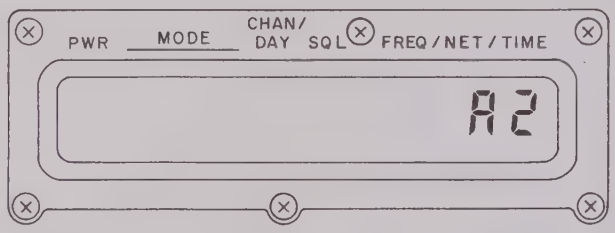
DISPLAY	FAULT CONDITION	ACTION
	Battery voltage is less than 10 V dc	Replace battery.
	Antenna vswr is greater than 3.5:1	Check physical condition of antenna. If no damage is observed, replace antenna.
	Synthesizer has loss-of-lock	Replace A5. Refer to synthesizer section to repair A5.
	Receiver squelched	Replace A4. Refer to receiver section to repair A4.

Table 5-3. Transmit Faults (Cont).

DISPLAY	FAULT CONDITION	ACTION
 TPA-6421-011	Control RAM pattern not read	Replace A3. Refer to control/ECCM section to repair A3.
 TPA-6420-011	Power amplifier power output is below 2 watts.	Replace A2. Refer to power amplifier section for repair of A2.

5.3.4 Minimum Performance Test

Refer to table 5-4 for minimum performance test and to figure 5-6 for test setup.

Note

Should the minimum performance tests identify that there is a fault in the receiver-transmitter, disassembly of the receiver-transmitter may be necessary to identify the faulty circuit card/module. To disassemble the receiver-transmitter, follow the procedures in paragraph 5.6.1.

Table 5-4. Minimum Performance Tests.

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
1. Test setup	a. Connect the test equipment as shown in figure 5-6. b. Set the test fixture controls and in/out functions as follows unless otherwise specified.. PTT to OFF DATA/VOICE to VOICE WB XMT AUDIO - nc WB RCV AUDIO - nc NB XMT AUDIO - nc NB RCV AUDIO to distortion analyzer REXMT to voltmeter REMOTE DATA IN - nc REMOTE DATA OUT - nc		

Table 5-4. Minimum Performance Tests (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	c. Set the receiver-transmitter controls and connectors as follows unless otherwise specified. OFF/TEST/ON/LITE to ON VOL to midrange PWR to test fixture ANT to signal generator @ 30.0000-MHz FM ±7 kHz, 1-kHz tone, 0.5 μV AUDIO to H-250/U Handset (connect to left connector)		
	d. Using the cursor and column switches, input the following information into the receiver-transmitter unless otherwise specified.		
	PWR MODE CHAN/DAY SQL FREQ/NET/TIME LO NO HOP 1 OFF 30.000 LO NO HOP 2 OFF 36.125 LO NO HOP 3 OFF 39.250 LO NO HOP 4 OFF 44.375 LO NO HOP 5 OFF 51.975 LO NO HOP 6 OFF 52.000 LO NO HOP 7 OFF 63.725 LO NO HOP 8 OFF 75.850 LO NO HOP 9 OFF 87.975 LO TIME Current day OFF Local time LO HOP 1 OFF 111 LO HOP 2 OFF 222 LO HOP 3 OFF 333 LO HOP 4 OFF 444 LO HOP 5 OFF 555 LO HOP 6 OFF 666 LO HOP 7 OFF 777 LO HOP 8 OFF 799 LO HOP 9 OFF 000		
2. Signal, noise, and distortion (sinad)	a. Connect a dmm to the +12-V dc jack on the test fixture.	+12.5 ±0.5 V dc	Adjust power supply.
	b. Measure the sinad in decibels for each of the NO HOP channels 1 through 9.	NLT 10 dB	If A5P3 rf level into 50 Ω is +8 to +12 dBm, replace A4. If not, replace A5.
3. (s+n)/n	a. Set signal generator for 100 μV.		If test 2 is ok, replace A5. If not, replace A4.
	b. Measure the (s+n)/n in decibels for each of the NO HOP channels 1 through 9.	NLT 30 dB	
4. WB RCV AUDIO	a. Set signal generator for 100 μV.		
	b. Connect a dmm to WB RCV AUDIO jack on the test fixture.		

Table 5-4. Minimum Performance Tests (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	c. Measure the dc and ac components at WB RCV AUDIO jack. The dc component can be measured by removing the modulation from the signal generator signal.	ac - 1.095 to 1.375 V rms dc - 2.5 to 3.3 V dc	If A5P3 rf frequency is 29.999783 to 30.000217, replace A4. If not, replace A5.
5. NB RCV AUDIO	a. Set signal generator for 100 μV.		
	b. Connect a dmm to NB RCV AUDIO jack on the test fixture.		
	c. Turn VOL control fully clockwise.		
	d. Measure rms audio output at NB RCV AUDIO jack with the handset disconnected from the receiver-transmitter.	NLT 3.46 V rms	Replace A3.
	e. Measure the audio level at +12-V dc jack on the test fixture.	1.0 to 1.4 V rms	Replace A1.
6. Retransmit and squelch	a. Set signal generator for 30.000 MHz ±2.5 kHz and 150 ±2-Hz tone at 0.5 μV.		
	b. Set the receiver-transmitter as follows: PWR to LO MODE to NO HOP CHAN to 1 SQL to ON FREQ to 30.000		
	c. Measure the dc level at REXMT jack on the test fixture.	0 to 1 V dc	
	d. Reduce signal generator to 0.4 μV and repeat step c.	0 to 1 V dc	
	e. Reduce signal generator to 0.1 μV and repeat step c.	11.8 to 13.2 V dc	If noise is no longer present in handset, replace A3. If noise is still present in handset, replace A4.
	f. Measure the dc level at J3-E and J4-E (AUDIO jacks) to verify that they are the same as REXMT jack.	Same as steps c, d, and e.	Replace A1.
7. Transmit frequency	a. On the test fixture, set the DATA/VOICE to DATA.		
	b. Connect a 30-dB pad and the frequency counter to the ANT connector on the receiver-transmitter.		
	c. On test fixture, set PTT to KEY.		

Table 5-4. Minimum Performance Tests (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	d. Measure the transmit frequency for channel 9, NO HOP mode.	87.974226 to 87.975774 MHz	Replace A5.
	e. On test fixture, set PTT to OFF.		
8. Transmit power output	a. Connect a 30-dB pad and rf wattmeter to the ANT connector on the receiver-transmitter.		
	b. On test fixture, set PTT to KEY.		
	c. Measure power output in NO HOP mode for channel 1 through 9 in both LO and HI power.	LO - 0.15 to 0.4 W HI - 4.0 to 6.0 W	1. Measure A5P4 rf level into 50 Ω. If not -7 to -11 dBm, replace A5. 2. Measure A4J3 rf level into 50 Ω. If +6 to +13 dBm, replace A2. If not, replace A4.
	d. On test fixture, set PTT to OFF.		
	e. Connect +24 V dc to REMOTE DATA IN jack on test fixture.		
	f. On receiver-transmitter, set PWR to HI.		
	g. On test fixture, set PTT to KEY.		
	h. Measure the power output in NO HOP mode for channels 1 through 9.	2.0 to 3.0 W	
	i. On test fixture, set PTT to OFF.		
9. Transmit sidetone	a. Connect a 30-dB pad and a signal generator to ANT connector on receiver-transmitter.		
	b. Connect function genrator at 1.4 V rms, 1-kHz sine wave to NB XMT AUDIO jack on test fixture.		
	c. Set signal generator for 3.16 mV at 30.000-MHz FM ±7 kHz deviation at 1-kHz tone to the pad.		
	d. On receiver-transmitter set: PWR to LO MODE to NO HOP CHAN to 1 SQL to ON		
	e. Connect distortion analyzer to NB RCV AUDIO jack on test fixture.		
	f. On test fixture, set PTT to KEY.		

Table 5-4. Minimum Performance Tests (Cont).

TEST	PROCEDURE	NORMAL INDICATION	IF INDICATION IS ABNORMAL
	g. Measure percent of distortion.	10% max	Probe A2P1-34 and measure audio distortion. If greater than 5%, replace A2. If not, probe A5P1-1 and measure audio distortion. If greater than 5%, replace A3A1. If not, measure audio distortion at output of modulation meter. If greater than 10%, replace A5. If not, perform test 3.
	h. On test fixture, set PTT to OFF.		
	i. On receiver-transmitter set: SQL to OFF Remove handset.		
	j. Establish a zero reference on distortion analyzer.		
	k. On test fixture, set PTT to ON; set DATA/ VOICE to VOICE.		
	l. Measure decibel drop from receive signal to sidetone	-6 ±3.0 dB	Replace A3A1.
	m. On test fixture, set PTT to OFF.		
10. Transmit deviation	a. Connect a 30-dB pad and FM modulation meter to ANT connector.		
	b. Set modulation meter to 3000-Hz low pass and connect distortion analyzer to audio output of meter.		
	c. Disconnect function generator from NB XMT AUDIO on test fixture.		
	d. On test fixture, set PTT to KEY.		
	e. Measure the 150-Hz peak-to-peak FM deviation and distoriton in NO HOP mode.	2.5 to 3.5 kHz, 23 dB min	If all readings are outside normal indication or near normal indication on same side (ie, either high or low), replace A5. If not, replace A3.
	f. On test fixture, set PTT to OFF.		

section 6
parts list

6.1 INTRODUCTION

6.1.1 General

The purpose of this parts list, prepared by Collins Telecommunications Products Division of Rockwell International, is for identification and requisition of parts.

Parts listed meet critical equipment design specification requirements. Use only part numbers specified in this parts list for replacement of parts.

6.1.2 Group Assembly Parts List

FIG-ITEM Column — Digits preceding the dash are figure numbers. Digits following the dash are item numbers assigned in sequence to correspond with item numbers on the illustrations.

PART NO Column — Listed are MIL standard and vendor part numbers.

INDENT Column — Items are coded 1, 2, 3, etc, to indicate the relationship to the next higher assembly.

DESCRIPTION Column — Listed are the noun name, modifier, descriptive information, federal manufacturer's code, reference designation, attaching part (AP), reference to other figures, and effectivities.

Attaching parts are identified by (AP) following the part or parts they attach.

Effectivities are identified by the following methods: MCN (Manufacturer Control Number) 101 and up; CI (Configuration Identifier) 5-digit number; REV (Revision Identifier) dash (—) denotes original, letter A first change, letter B second change, etc. One of the above identifiers is listed on each chassis and/or replaceable assembly. Service bulletins are identified by SB 1, SB 2, etc.

UNITS PER ASSY Column — Quantities specified are per item number. Letters AR denote the selection of parts as required. Letters REF refer to an assembly completely assembled on a preceding figure and illustration.

USABLE ON CODE Column — Part variations within a group of equipment are indicated by a letter code (A, B, C, etc). Absence of a code indicates part applies to all models.

6.1.3 Numerical Index

PART NUMBER Column — Part numbers are listed in alphanumeric sequence.

FIG-ITEM Column — Digits preceding the dash are figure numbers. Digits following the dash are item numbers.

TTL REQ Column — Listed is the total quantity of parts or assemblies covered in the Group Assembly Parts List.

6.1.4 Reference Designation Index

REFERENCE DESIGNATION Column — Reference designations are listed in alphanumeric sequence.

FIG-ITEM Column — Digits preceding the dash are figure numbers. Digits following the dash are item numbers.

PART NUMBER Column — Part numbers listed are for items that have reference designations assigned.

6.1.5 How To Use This Parts List

To locate a part number if the assembly in which the part is used is known, turn to the List of Illustrations and find the page number for the assembly in which the part is used. Locate the part and its index number on the illustration and find the index number on the Group Assembly Parts List page to determine its description and part number.

To locate the illustration for a part if the part number is known, refer to the Numerical Index and find the part number. Turn to the Group Assembly Parts

List and find the first figure and index number indicated in the Numerical Index for that part. If this figure shows the part in a section or system of the equipment other than the one desired, refer to the other figure numbers listed in the Numerical Index.

To locate the illustration for a part if the reference designation is known, refer to the Reference Designation Index and find the symbol; turn to the Group Assembly Parts List and find the figure and index number indicated in the index.

Caution

This equipment contains electrostatic discharge sensitive (ESDS) devices. Special handling methods and materials must be used to prevent equipment damage. Refer to the maintenance section for the equipment before assembly/disassembly or repair is performed. ESDS items are identified in the description column of the parts list by (ESDS).

All supporting parts list illustrations that contain ESDS items are shown with the following symbol.

6.1.6 Manufacturer's Code, Name, and Address

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
00779	AMP INC P O BOX 3608 HARRISBURG PA 17105
06776	ROBINSON NUGENT INC 800 E 8TH ST P O BOX 470 NEW ALBANY IN 47150
12617	HAMLIN INC GROVE AND LAKE STS LAKE MILLS WI 53551
12998	QUALITY NAME PLATE INC MILL ROAD EAST GLASTONBURY CT 06025
13499	ROCKWELL INTERNATIONAL CORP COLLINS TELECOMMUNICATIONS PRODUCTS DIV 855 35TH ST NE P O BOX 728 CEDAR RAPIDS IA 52498
22627	MULTIFORM DESICCANT PRODUCTS INC 1418 NIAGARA ST BUFFALO NY 14213
25330	GENERAL CONNECTOR CORP SUB OF THE UNION CORP 80 BRIDGE ST NEWTON MA 02158
45722	USM CORP SUB OF EMHART INDUSTRIES INC PARKER-KALON FASTENER DIV CAMPBELLSVILLE KY 42718
53387	MINNESOTA MINING AND MFG CO ELECTRONIC PRODUCTS DIV 3M CENTER ST PAUL MN 55101
55267	HUGHES AIRCRAFT CO SOLID STATE PRODUCTS DIV 500 SUPERIOR AVE NEWPORT BEACH CA 92263
55578	CTS OF WEST LIBERTY INC 6800 COUNTY RD 189 WEST LIBERTY OH 43357
56289	SPRAGUE ELECTRIC CO 87 MARSHALL ST NORTH ADAMS MA 01247
56878	SPS TECHNOLOGIES INC HIGHLAND AVE JENKINTOWN PA 19046
71744	GENERAL INSTRUMENT CORP LAMP DIV 4433 N RAVENS WOOD AVE CHICAGO IL 60640
72982	ERIE TECHNOLOGICAL PRODUCTS INC 645 W 11TH ST ERIE PA 16512
74921	ITEN FIBRE CO THE 4001 BENEFIT AVE P O BOX 9 ASHTABULA OH 44004
76376	MECHANICAL RUBBER PRODUCTS CO INC 29 FORESTER AVE P O BOX DRAWER C WARWICK NY 10990
79963	ZIERICK MFG CO RADIO CIRCLE MT KISCO NY 10549
80058	JOINT ELECTRONIC DESIGNATION SYSTEM

MFR CODE	MANUFACTURER'S NAME AND ADDRESS
81349	MILITARY SPECIFICATIONS
82104	STANDARD GRIBSBY INC 920 RATHBONE AVE AURORA IL 60507
86928	SEASTROM MFG CO INC 701 SONORA AVE GLENDALE CA 91201
94375	AUTOMATIC CONNECTOR INC 400 MORELAND RD COMMACK NY 11725
95987	WECKESSER CO INC 4444 WEST IRVING PARK RD CHICAGO IL 60641
96906	MILITARY STANDARD
97539	APM-HEXSEAL CORP 44 HONECK ST ENGLEWOOD NJ 07631
98278	MICRODOT MANUFACTURING INC MALCO SOUTH PASADENA DIV 220 PASADENA AVE SOUTH PASADENA CA 91030
99800	AMERICAN PRECISION INDUSTRIES INC DELEVAN DIV 270 QUAKER RD EAST AURORA NY 14052

6.1.7 Reference Designation Prefixes

The following prefixes have been assigned in this manual:

PREFIX	UNIT PART NUMBER	FIG-ITEM
A1	652-0682-001	6-3-
A1A1	646-5944-001	6-4-
A2	646-5942-001	6-2-11
A3	652-0710-001	6-2-14
A4	646-5947-001	6-2-16
A5	646-5954-001	6-2-18

6.1.8 Configuration Identifiers

The following CI's/REV LTR's were used in compiling data for this manual:

CI/ REV LTR	UNIT PART NUMBER	FIG-ITEM
REV H	622-6604-001	6-1-1
REV B	622-6626-001	6-1-2
REV C	652-2251-001	6-2-5
REV A	652-2252-XXX	6-2-20
REV A	652-0710-001	6-2-14
REV G	652-0682-001	6-3-
REV C	646-5944-001	6-4-

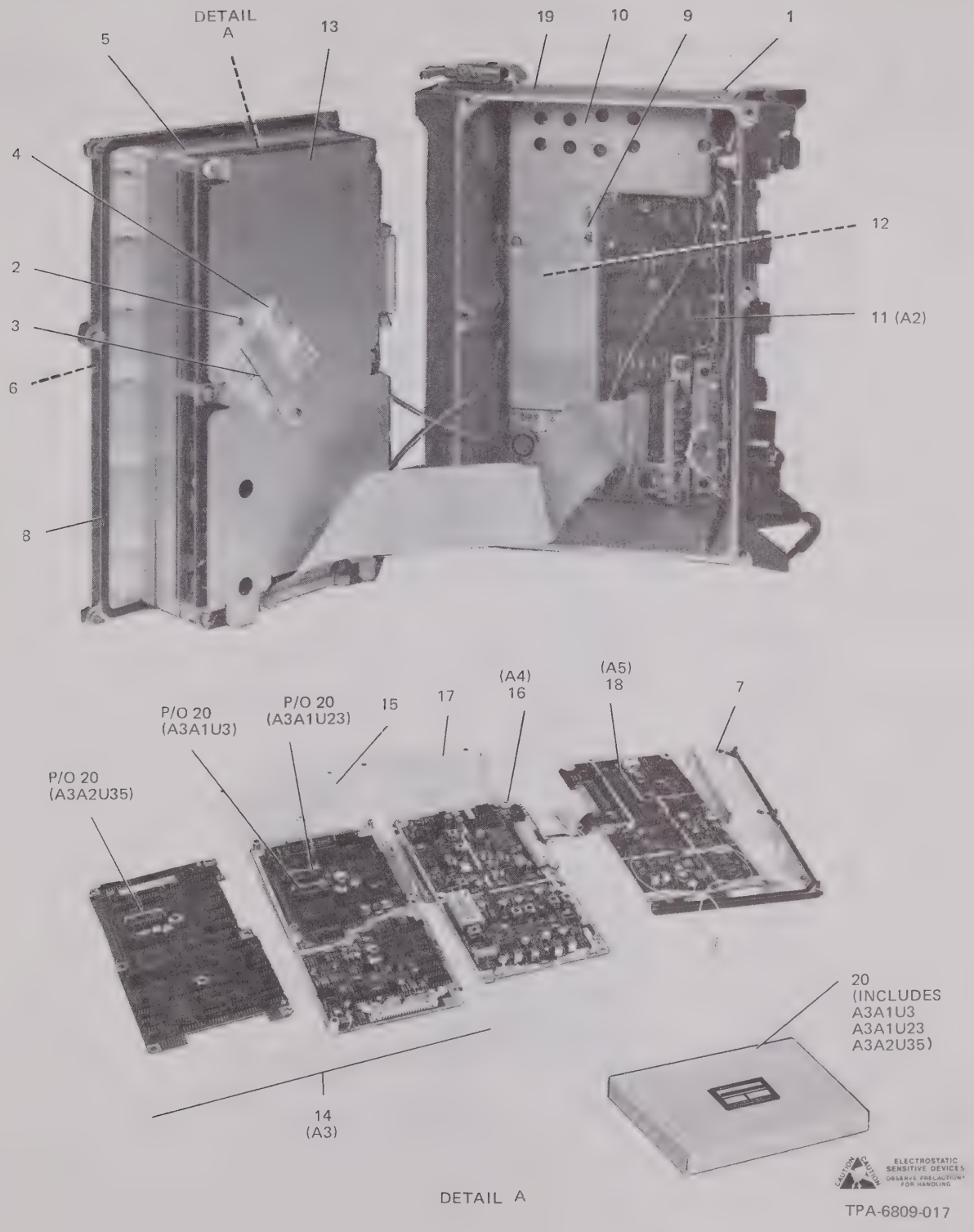
6.2 GROUP ASSEMBLY PARTS LIST

TPA-6731-017

628K-1 Receiver-Transmitter and 938X-1 Broadband Antenna
Figure 6-1

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
6-1-1	622-6604-001	1	RECEIVER - TRANSMITTER, 628K-1 (SEE FIG 6-2)	1	
2	622-6626-001	1	BROADBAND ANTENNA, 938X-1 (SEE FIG 6-5)	1	

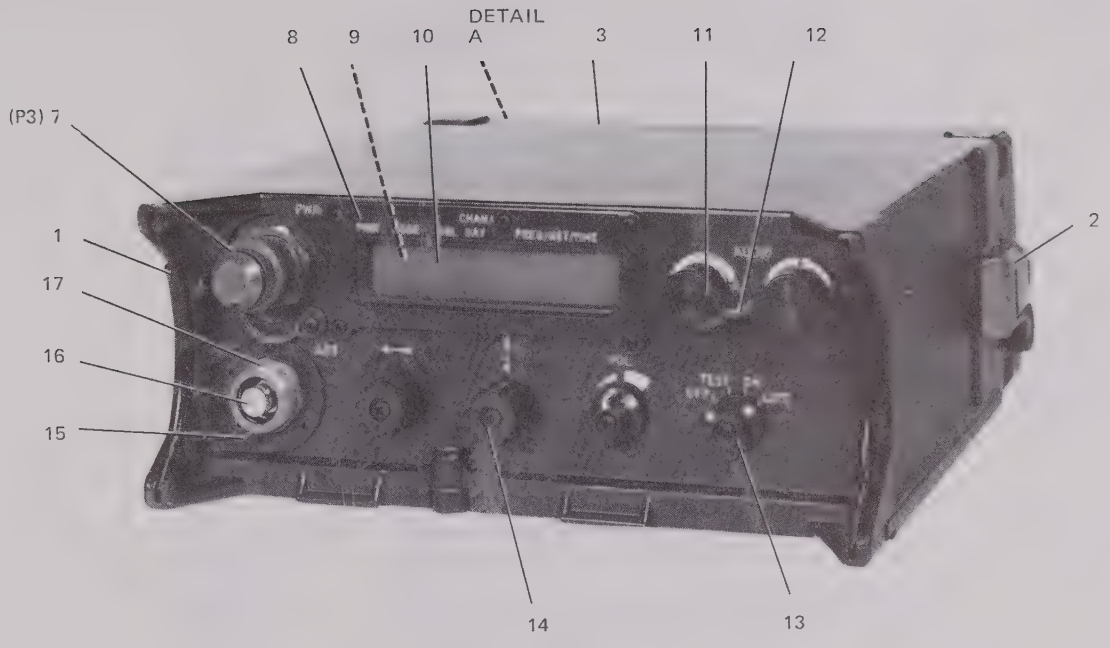


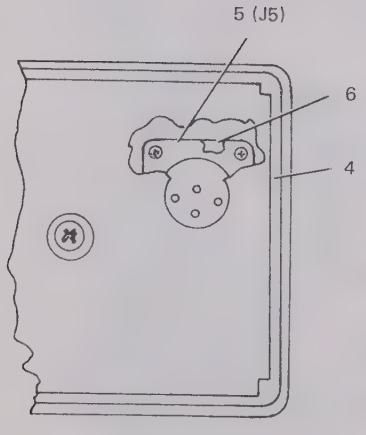
628K-1 Receiver-Transmitter
Figure 6-2

GROUP ASSEMBLY PARTS LIST

	FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
	6-2-	622-6604-001	1	RECEIVER - TRANSMITTER, 628K-1 (ESDS) (SEE FIG 6-1-1 FOR NHA)	REF	
	1	642-0190-000	2	PLATE, IDENT	1	
		330-1551-000	2	SCREW,TPG,THD CD PL STL, 2-56 X 1/8 (45722) (AP)	2	
	2	FPNY-2000NA	2	CLAMP,FLAT CABLE (95987) 150-0885-010	1	
		MS51957-17	2	SCREW,MACH STL, 4-40 X 1/2 (96906) 343-0137-000 (AP)	2	
		MS15795-803	2	WASHER,FLAT CRES, 0.125ID X 0.250 OD (96906) 310-0779-030 (AP)	2	
	3	652-1720-001	2	STRIP, RUBBER	1	
	4	02-00041AG13	2	DESICCANT,MLCLR SV (22627) 005-2738-010	2	
	5	652-2251-001	2	RECEIVER - TRANSMITTER, BASIC	1	
	6	652-1581-001	3	DECAL, IDENT	1	
	7	652-0518-001	3	COVER, CHASSIS	1	
		BK OXD CRES.164-32X.625IN	3	SCREW,SELF LOCKING BK OXD CRES, 0.164-32 X 0.625IN (56878) 330-1716-960 (AP)	6	
		5610-59-32	3	WASHER,NM NYL, 0.144IDX0.270OD (86928) 302-0644-100 (AP)	6	
	8	652-0995-001	3	GASKET, COVER - CHASSIS	1	
	9	280-2745-010	3	LABEL,WARNING (12998)	1	
	10	651-3883-001	3	COVER, PA	1	
	11	646-5942-001	3	AMPLIFIER, POWER (ESDS) A2	1	
		MS51957-32	3	SCREW,MACHINE CRES, 0.138-32 X 0.750IN (96906) 343-0174-000 (AP FOR 10,11)	5	
		MS35338-136	3	WASHER,LOCK SST, 0.141 ID X 0.250 0D (96906) 310-0282-000 (AP FOR 10,11)	5	
		5610-19-20	3	WASHER,NM NYL, 0.120IDX0.220OD (86928) 302-0644-140 (AP FOR 10,11)	5	
	12	646-7023-001	3	RETAINER	2	
		PSVT CRES.138-32 X.250IN	3	SCREW,SELF LOCKING PSVT CRES, 0.138-32 X 0.250IN (56878) 330-1716-250 (AP FOR 11,12)	5	
	13	652-2258-001	3	SHIELD-ECCM	1	
	14	652-0710-001	3	CONTROL/ECCM (ESDS) A3 (A3A1U3,A3A1U23,A3A2U35 NOT INCLUDED)	1	
	15	652-0515-001	3	SHIELD, SPACER	1	
		MS51957-33	3	SCREW,MACHINE CRES, 0.138-32 X 0.875IN (96906) 343-0175-000 (AP FOR 14,15)	2	
		MS35338-136	3	WASHER,LOCK SST, 0.141 ID X 0.250 0D (96906) 310-0282-000 (AP FOR 14,15)	2	
		MS15795-805	3	WASHER,FLAT CRES, 0.164ID X 0.320 OD (96906) 310-0779-050 (AP FOR 14,15)	2	
	16	646-5947-001	3	RECEIVER (ESDS) A4	1	
	17	652-0517-001	3	SPACER	1	
	18	646-5954-001	3	SYNTHESIZER (ESDS) A5	1	
		MS51957-54	3	SCREW,MACHINE SST, 8-32 X 2-1/4 (96906) 343-0199-000 (AP FOR 13-18)	6	
		MS35338-137	3	WASHER,LOCK CRES, 0.171 ID X 0.293 OD (96906) 310-0072-000 (AP FOR 13-18)	6	
		MS15795-807	3	WASHER,FLAT CRES, 0.196ID X 0.390 OD (96906) 310-0779-070 (AP FOR 13-18)	6	
	19	652-0682-001	3	CHASSIS (ESDS) A1	1	
1	20	652-2252-XXX	2	KIT, SOFTWARE (INCLUDES A3A1U3, A3A1U23, A3A2U35)	1	

1 SEE NAMEPLATE FOR APPLICABLE STATUS



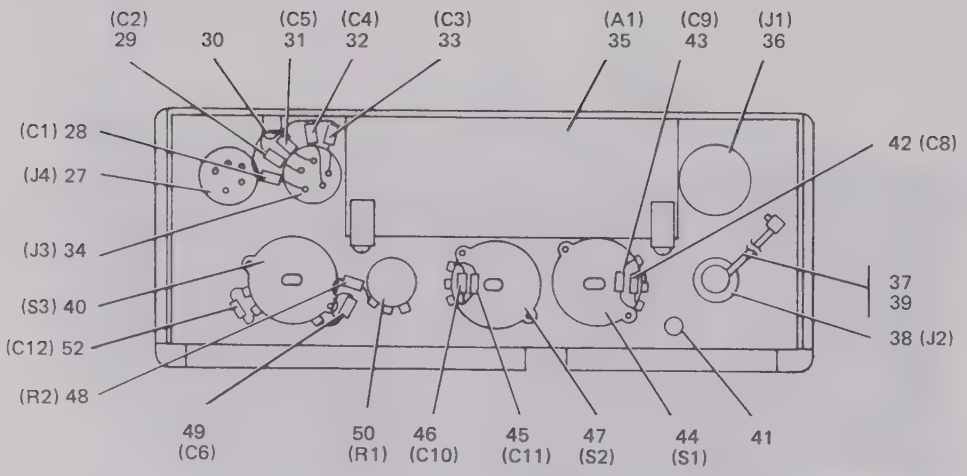


DETAIL A

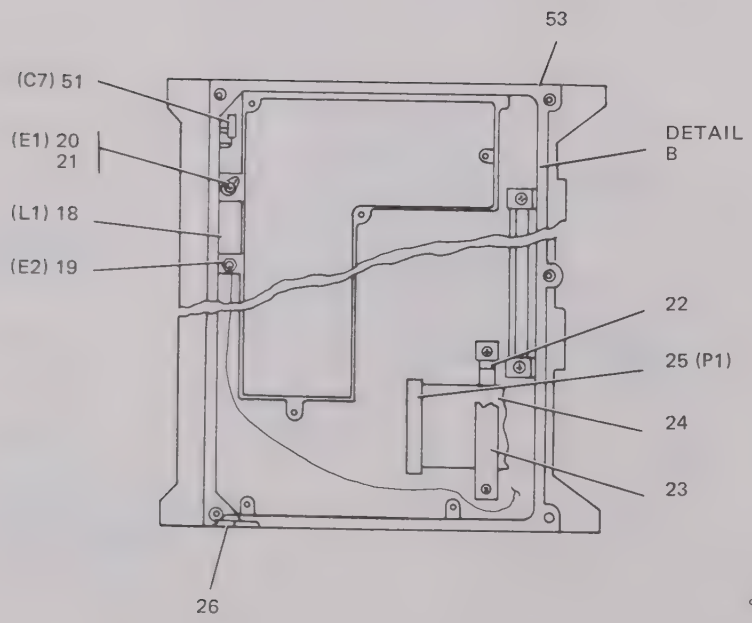
ELECTROSTATIC SENSITIVE DEVICES
OBSERVE PRECAUTIONS FOR HANDLING

TPA-6732-027

Chassis A1
Figure 6-3 (Sheet 1 of 2)



DETAIL B



TPA-6732-027

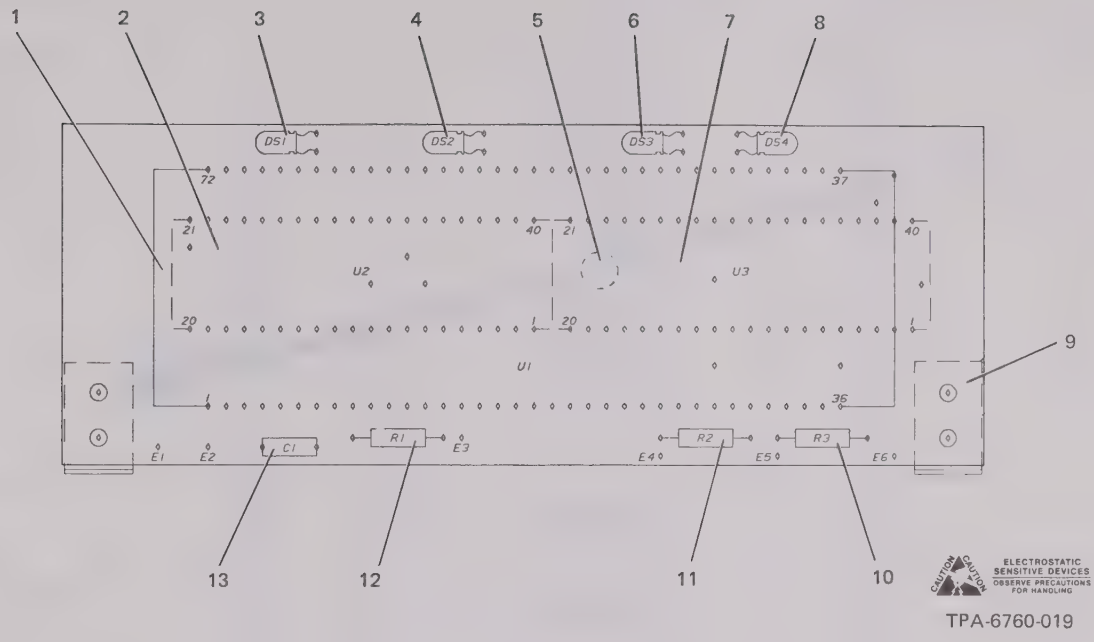
Chassis A1
Figure 6-3 (Sheet 2)

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
6-3-	652-0682-001	1	CHASSIS (ESDS) A1 (SEE FIG 6-2-19 FOR NHA)	REF	
1	015-3934-010	2	HANDLE	2	
	MS16562-201	2	PIN,SPR SST, 0.078 DIA X 3/8 (96906) 311-0357-000 (AP)	4	
2	015-3935-010	2	CATCH	2	
	MS51957-26B	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0032-000 (AP)	4	
3	652-0982-001	2	PLATE, RETAINING	1	
	MS51957-26B	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0032-000 (AP)	2	
4	652-0996-001	2	GASKET, BATTERY CASE	1	
5	GC075	2	CONNECTOR,BATTERY (25330) 371-0521-010 A1J5	1	
	330-1813-030	2	SCREW,SEALING CRES, 4-40 X 5/16 (97539) (AP)	4	
6	651-4520-001	2	GASKET, CONNECTOR	1	
7	U-317/U	2	CONNECTOR,RCPT ELEC (80058) 371-0520-020 A1P3	1	
	MS51957-14B	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0020-000 (AP)	1	
	302-0007-000	2	WASHER,SHLDR FBR, 1/8 ID X 3/8 OD (74921) (AP)	1	
8	651-4518-001	2	BEZEL	1	
	MS51957-14B	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0020-000 (AP)	6	
9	652-0997-001	2	GASKET, BEZEL	1	
10	651-4507-001	2	WINDOW, DISPLAY	1	
11	0N198894	2	CAP,RUBBER (76376) 200-2522-010	2	
	MS51957-14B	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0020-000 (AP)	1	
	302-0007-000	2	WASHER,SHLDR FBR, 1/8 ID X 3/8 OD (74921) (AP)	1	
12	42931-2	2	SLEEVE,SPLICING (00779) 015-3939-010	2	
13	MS91524-9AP3T0X	2	KNOB,CONTROL (96906) 281-0637-010	2	
	MS51957-26B	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0032-000 (AP)	2	
14	652-1014-001	2	KNOB	2	
	MS51957-26B	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0032-000 (AP)	2	
	MS51963-34	2	SETSCREW CD PL STL, 8-32 X 3/16 (96906) 328-5043-000 (AP)	4	
15	651-4519-001	2	ADAPTOR, ANTENNA	1	
16	MS9021-113	2	'O'-RING (96906) 200-2127-000	1	
17	652-0886-001	2	RING, LOCKING	1	
	MS51957-2B	2	SCREW,MACH SST, 2-56 X 3/16 (96906) 343-0669-000 (AP)	1	
18	BP-2267-1	2	COIL,RF 3.3UH (99800) 240-0884-010 A1L1	1	
19	SE099E01	2	TERMINAL,FEEDTH (81349) 306-2514-010 A1E2	1	
20	SE099E01	2	TERMINAL,FEEDTH (81349) 306-2514-010 A1E1	1	
21	403	2	TERMINAL,LUG (79963) 304-1089-000	1	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP FOR 20,21)	1	
22	652-0784-001	2	STRIP, RUBBER	1	
23	FPNY-2000NA	2	CLAMP,FLAT CABLE (95987) 150-0885-010	1	
	MS51957-14B	2	SCREW,MACH SST, 4-40 X 5/16 (96906) 343-0020-000 (AP)	2	
24	CAB-34-CC	2	CABLE,FLAT RIBBON (06776) 424-0855-060	1	
25	3414-6000	2	CONNECTOR,PLUG ELEC (53387) 372-2634-010 A1P1	1	
26	330-1813-020	2	SCREW,SEALING CRES, 4-40 X 1/4 (97539)	1	
27	U-183/U	2	CONNECTOR,RCPT ELEC (80058) 372-2180-000 A1J4	1	
28	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C1	1	
29	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C2	1	
30	403	2	TERMINAL,LUG (79963) 304-1089-000	1	
	MS51957-13	2	SCREW,MACH STL, 4-40 X 1/4 (96906) 343-0133-000 (AP)	1	
	MS35338-135	2	WASHER,LOCK SST, 0.115 ID X 0.209 OD (96906) 310-0279-000 (AP)	1	
31	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C5	1	
32	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C4	1	
33	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C3	1	
34	U-183/U	2	CONNECTOR,RCPT ELEC (80058) 372-2180-000 A1J3	1	
35	646-5944-001	2	DISPLAY BOARD (ESDS) A1A1 (SEE FIG 6-4)	1	
	MS51957-26B	2	SCREW,MACH SST, 6-32 X 1/4 (96906) 343-0032-000 (AP)	2	
36	U-318/U	2	CONNECTOR,RCPT ELEC (80058) 371-0520-010 A1J1	1	
37	652-0727-001	2	CABLE, COAXIAL	1	

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
6-38	901-B4900X-80	3	CONNECTOR,RCPT ELEC (94375) 357-0569-010 A1J2	1	
39	140-0530-5019	3	CABLE ASSEMBLY,ELEC (98278) 426-5435-350 (INCLUDES A1P2)	1	
40	504024MLR1	2	SWITCH,ROTARY (82104) 259-2959-010 A1S3	1	
41	280-2745-040	2	LABEL,WARNING (12998)	1	
42	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C8	1	
43	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C9	1	
44	499754MLR1	2	SWITCH,ROTARY (82104) 259-2959-020 A1S1	1	
45	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C11	1	
46	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C10	1	
47	499754MLR1	2	SWITCH,ROTARY (82104) 259-2959-020 A1S2	1	
48	RN55D1002F	2	RESISTOR,FIXED FILM, 10K, 1%, 1/8W (81349) 705-1044-000 A1R2	1	
49	8131 M050 Z5U 10 5M	2	CAPACITOR,FIXED CER DIEL, 1UF, 20%, 50V (72982) 913-3279-270 A1C6	1	
50	550	2	RESISTOR,VARIABLE CERMET, 10K, 20%, 1W (55578) 376-0504-010 A1R1	1	
51	CK05BX102K	2	CAPACITOR,FIXED CER DIEL, 1000PF, 10%, 200V (81349) 913-4018-000 A1C7	1	
52	CK05BX103K	2	CAPACITOR,FIXED CER DIEL, 0.01UF, 10%, 100VDC (81349) 913-5019-200 A1C12	1	
53	651-3884-002	2	CHASSIS	1	



Display Board A1A1
Figure 6-4

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
6-4-	646-5944-001	1	DISPLAY BOARD (ESDS) A1A1 (SEE FIG 6-3-35 FOR NHA)	REF	
1	4833	2	DISPLAY,LIQUID XTAL (12617) 262-2861-010 A1A1U1	1	
2	HLCD0438AP	2	INTEGRATED CIRCUIT LCD DRIVER (ESDS) (55267) 351-8940-020 A1A1U2	1	
3	CM8111	2	LAMP,INCANDESCENT (71744) 262-1398-120 A1A1DS1	1	
4	CM8111	2	LAMP,INCANDESCENT (71744) 262-1398-120 A1A1DS2	1	
5	280-2745-040	2	LABEL,WARNING (12998)	1	
6	CM8111	2	LAMP,INCANDESCENT (71744) 262-1398-120 A1A1DS3	1	
7	HLCD0438AP	2	INTEGRATED CIRCUIT LCD DRIVER (ESDS) (55267) 351-8940-020 A1A1U3	1	
8	CM8111	2	LAMP,INCANDESCENT (71744) 262-1398-120 A1A1DS4	1	
9	652-0647-001	2	BRACKET	2	
	MS16535-52	2	RIVET,TUBULAR CS, 0.089 DIA X 0.125 (96906) 305-1731-000 (AP)	4	
10	RN55D1002F	2	RESISTOR,FIXED FILM, 10K, 1%, 1/8W (81349) 705-1044-000 A1A1R3	1	
11	RN55D1002F	2	RESISTOR,FIXED FILM, 10K, 1%, 1/8W (81349) 705-1044-000 A1A1R2	1	
12	RN55D1002F	2	RESISTOR,FIXED FILM, 10K, 1%, 1/8W (81349) 705-1044-000 A1A1R1	1	
13	923CC0G390K200B	2	CAPACITOR,FIXED CER DIEL, 39PF, 10%, 200VDC (56289) 913-3325-140 A1A1C1	1	

TPA-6730-017

938X-1 Broadband Antenna
Figure 6-5

GROUP ASSEMBLY PARTS LIST

FIG-ITEM	PART NO	INDENT	DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
6-5-	622-6626-001	1	BROADBAND ANTENNA, 938X-1 (SEE FIG 6-1-2 FOR NHA)	REF	
1	642-0163-000	2	NAMEPLATE, ADHESIVE	1	
2	652-0949-002	2	COUPLER, ANTENNA	1	
			OR		
2	652-0949-001	2	COUPLER, ANTENNA	1	
3	013-1646-010	2	ANTENNA	1	

6.3 NUMERICAL INDEX

PART NUMBER	FIG-ITEM	TTL REQ
BK OXD CRES.164-32X.625IN	6-2-7	6
BP-2267-1	6-3-18	1
CAB-34-CC	6-3-24	1
CK05BX102K	6-3-51	1
CK05BX103K	6-3-28	
	6-3-29	
	6-3-31	
	6-3-32	
	6-3-33	
	6-3-42	
	6-3-43	
	6-3-45	
	6-3-46	
	6-3-52	10
CM8111	6-4-3	
	6-4-4	
	6-4-6	
	6-4-8	4
FPNY-2000NA	6-2-2	
	6-3-23	2
GC075	6-3-5	1
HLCD0438AP	6-4-2	
	6-4-7	2
MS15795-803	6-2-2	2
MS15795-805	6-2-15	2
MS15795-807	6-2-18	6
MS16535-52	6-4-9	4
MS16562-201	6-3-1	4
MS35338-135	6-3-21	
	6-3-30	2
MS35338-136	6-2-11	
	6-2-15	7
MS35338-137	6-2-18	6
MS51957-13	6-3-30	1
MS51957-14B	6-3-7	
	6-3-8	
	6-3-11	
	6-3-23	10
MS51957-17	6-2-2	2
MS51957-2B	6-3-17	1
MS51957-26B	6-3-2	
	6-3-3	
	6-3-13	
	6-3-14	
	6-3-35	12
MS51957-32	6-2-11	5
MS51957-33	6-2-15	2
MS51957-54	6-2-18	6
MS51963-34	6-3-14	4
MS9021-113	6-3-16	1
MS91524-9AP3T0X	6-3-13	2
PSVT CRES.138-32 X.250IN	6-2-12	5
RN55D1002F	6-3-48	
	6-4-10	
	6-4-11	
	6-4-12	4
SE099E01	6-3-19	
	6-3-20	2
U-183/U	6-3-27	
	6-3-34	2
U-317/U	6-3-7	1
U-318/U	6-3-36	1

PART NUMBER	FIG-ITEM	TTL REQ
0N198894	6-3-11	2
005-2738-010	6-2-4	2
013-1646-010	6-5-3	1
015-3934-010	6-3-1	2
015-3935-010	6-3-2	2
015-3939-010	6-3-12	2
02-00041AG13	6-2-4	2
140-0530-5019	6-3-39	1
150-0885-010	6-2-2	
	6-3-23	2
200-2127-000	6-3-16	1
200-2522-010	6-3-11	2
240-0884-010	6-3-18	1
259-2959-010	6-3-40	1
259-2959-020	6-3-44	
	6-3-47	2
262-1398-120	6-4-3	
	6-4-4	
	6-4-6	
	6-4-8	4
262-2861-010	6-4-1	1
280-2745-010	6-2-9	1
280-2745-040	6-3-41	
	6-4-5	2
281-0637-010	6-3-13	2
302-0007-000	6-3-7	
	6-3-11	2
302-0644-100	6-2-7	6
302-0644-140	6-2-11	5
304-1089-000	6-3-21	
	6-3-30	2
305-1731-000	6-4-9	4
306-2514-010	6-3-19	
	6-3-20	2
310-0072-000	6-2-18	6
310-0279-000	6-3-21	
	6-3-30	2
310-0282-000	6-2-11	
	6-2-15	7
310-0779-030	6-2-2	2
310-0779-050	6-2-15	2
310-0779-070	6-2-18	6
311-0357-000	6-3-1	4
328-5043-000	6-3-14	4
330-1551-000	6-2-1	2
330-1716-250	6-2-12	5
330-1716-960	6-2-7	6
330-1813-020	6-3-26	1
330-1813-030	6-3-5	4
3414-6000	6-3-25	1
343-0020-000	6-3-7	
	6-3-8	
	6-3-11	
	6-3-23	10
343-0032-000	6-3-2	
	6-3-3	
	6-3-13	
	6-3-14	
	6-3-35	12
343-0133-000	6-3-30	1
343-0137-000	6-2-2	2
343-0174-000	6-2-11	5
343-0175-000	6-2-15	2
343-0199-000	6-2-18	6

NUMERICAL INDEX

PART NUMBER	FIG-ITEM	TTL REQ
343-0669-000	6-3-17	1
351-8940-020	6-4-2	
	6-4-7	2
357-0569-010	6-3-38	1
371-0520-010	6-3-36	1
371-0520-020	6-3-7	1
371-0521-010	6-3-5	1
372-2180-000	6-3-27	
	6-3-34	2
372-2634-010	6-3-25	1
376-0504-010	6-3-50	1
403	6-3-21	
	6-3-30	2
424-0855-060	6-3-24	1
426-5435-350	6-3-39	1
42931-2	6-3-12	2
4833	6-4-1	1
499754MLR1	6-3-44	
	6-3-47	2
504024MLR1	6-3-40	1
550	6-3-50	1
5610-19-20	6-2-11	5
5610-59-32	6-2-7	6
622-6604-001	6-1-1	1
	6-2-	REF
622-6626-001	6-1-2	1
	6-5-	REF
642-0163-000	6-5-1	1
642-0190-000	6-2-1	1
646-5942-001	6-2-11	1
646-5944-001	6-3-35	1
	6-4-	REF
646-5947-001	6-2-16	1
646-5954-001	6-2-18	1
646-7023-001	6-2-12	2
651-3883-001	6-2-10	1
651-3884-002	6-3-53	1
651-4507-001	6-3-10	1
651-4518-001	6-3-8	1
651-4519-001	6-3-15	1
651-4520-001	6-3-6	1
652-0515-001	6-2-15	1
652-0517-001	6-2-17	1
652-0518-001	6-2-7	1
652-0647-001	6-4-9	2
652-0682-001	6-2-19	1
	6-3-	REF
652-0710-001	6-2-14	1
652-0727-001	6-3-37	1
652-0784-001	6-3-22	1
652-0886-001	6-3-17	1
652-0949-001	6-5-2	1
652-0949-002	6-5-2	1
652-0982-001	6-3-3	1
652-0995-001	6-2-8	1
652-0996-001	6-3-4	1
652-0997-001	6-3-9	1
652-1014-001	6-3-14	2
652-1581-001	6-2-6	1
652-1720-001	6-2-3	1
652-2251-001	6-2-5	1
652-2252-XXX	6-2-20	1
652-2258-001	6-2-13	1
705-1044-000	6-3-48	
705-1044-000	6-4-10	
	6-4-11	
	6-4-12	4
8131 M050 Z5U 10	6-3-49	1
901-B4900X-80	6-3-38	1
913-3279-270	6-3-49	1
913-3325-140	6-4-13	1
913-4018-000	6-3-51	1
913-5019-200	6-3-28	
	6-3-29	
	6-3-31	
	6-3-32	
	6-3-33	
	6-3-42	
	6-3-43	
	6-3-45	
	6-3-46	
	6-3-52	10
923CC0G390K200B	6-4-13	1

6.4 REFERENCE DESIGNATION INDEX

REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER	REFERENCE DESIGNATION	FIG-ITEM	PART NUMBER
A1	6-2-19	652-0682-001			
A1	6-3-	652-0682-001			
A1A1	6-3-35	646-5944-001			
A1A1	6-4-	646-5944-001			
A1A1C1	6-4-13	923CC0G390K200B			
A1A1DS1	6-4-3	CM8111			
A1A1DS2	6-4-4	CM8111			
A1A1DS3	6-4-6	CM8111			
A1A1DS4	6-4-8	CM8111			
A1A1R1	6-4-12	RN55D1002F			
A1A1R2	6-4-11	RN55D1002F			
A1A1R3	6-4-10	RN55D1002F			
A1A1U1	6-4-1	4833			
A1A1U2	6-4-2	HLCD0438AP			
A1A1U3	6-4-7	HLCD0438AP			
A1C1	6-3-28	CK05BX103K			
A1C10	6-3-46	CK05BX103K			
A1C11	6-3-45	CK05BX103K			
A1C12	6-3-52	CK05BX103K			
A1C2	6-3-29	CK05BX103K			
A1C3	6-3-33	CK05BX103K			
A1C4	6-3-32	CK05BX103K			
A1C5	6-3-31	CK05BX103K			
A1C6	6-3-49	8131 M050 Z5U 10 5M			
A1C7	6-3-51	CK05BX102K			
A1C8	6-3-42	CK05BX103K			
A1C9	6-3-43	CK05BX103K			
A1E1	6-3-20	SE099E01			
A1E2	6-3-19	SE099E01			
A1J1	6-3-36	U-318/U			
A1J2	6-3-38	901-B4900X-80			
A1J3	6-3-34	U-183/U			
A1J4	6-3-27	U-183/U			
A1J5	6-3-5	GC075			
A1L1	6-3-18	BP-2267-1			
A1P1	6-3-25	3414-6000			
A1P3	6-3-7	U-317/U			
A1R1	6-3-50	550			
A1R2	6-3-48	RN55D1002F			
A1S1	6-3-44	499754MLR1			
A1S2	6-3-47	499754MLR1			
A1S3	6-3-40	504024MLR1			
A2	6-2-11	646-5942-001			
A3	6-2-14	652-0710-001			
A4	6-2-16	646-5947-001			
A5	6-2-18	646-5954-001			

section 7
diagrams

7.1 CONFIGURATION STATUS CONTROL

Collins Telecommunications Products Division of Rockwell International uses a 2-character (maximum) alphabetic identifier for configuration identification. The alphabetic identifier is preceded by the letters REV (revision) and starts with — (dash) if no changes have been made. The first change is identified as A, the second as B, continuing through Z to AA, AB and ultimately to ZZ.

Note

The alphabetic identifier is not a serial number; therefore, many units or subassemblies may exist with the same identifier.

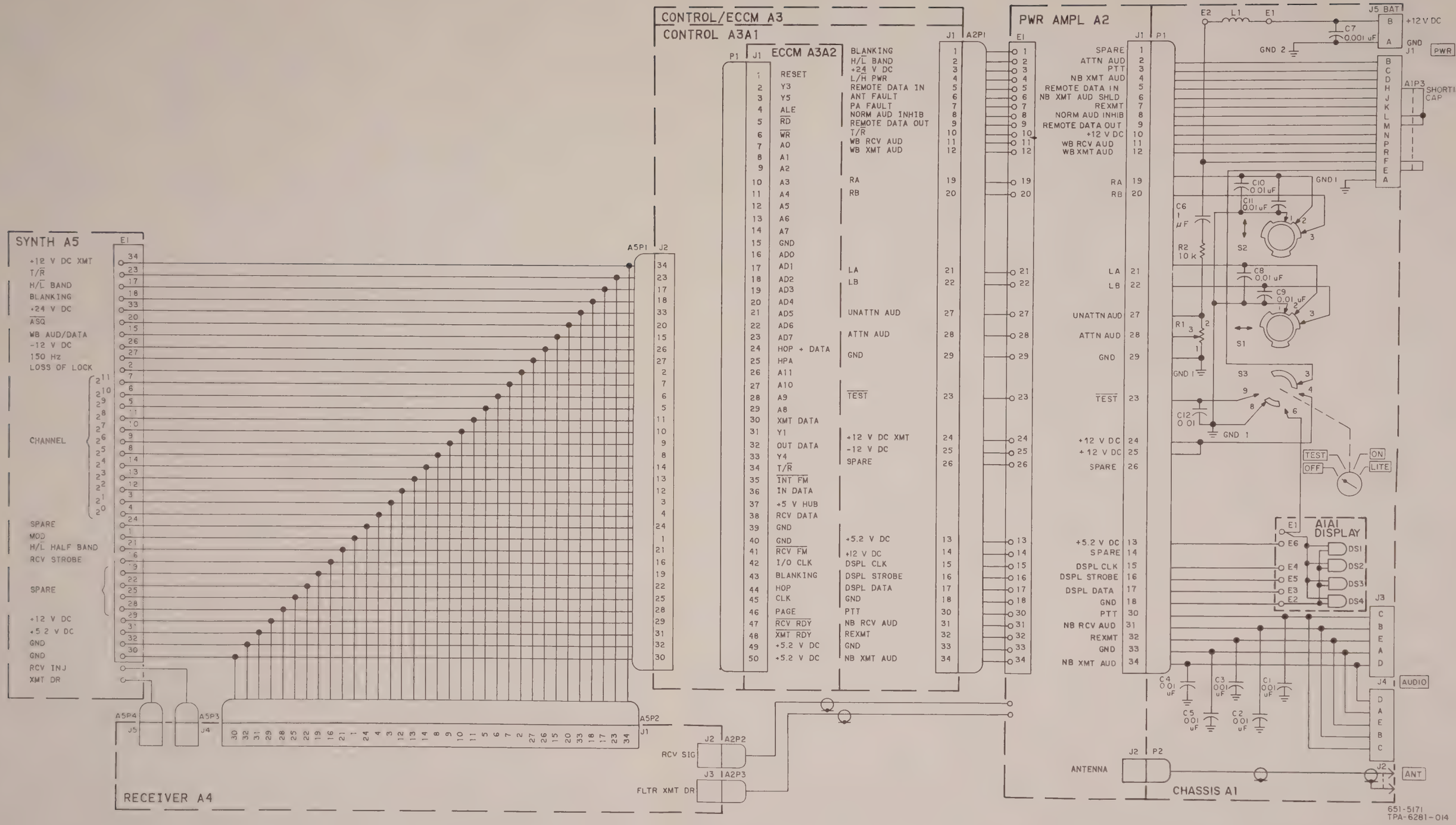
Incorporation of design changes in a unit or subassembly that has been returned to Rockwell-Collins for repair or has been removed from the company's finished goods inventory is defined as rework. At the time of rework, the unit or subassembly is marked again to reflect the design level to which it is being upgraded. This is done by leaving the original marking and adding the letters RWK (rework) followed by the alphabetic identifier of the latest change incorporated in the rework. For example, unit one may be marked REV B — RWK F and unit two may be marked REV F. A reworked unit may not contain all design changes made prior to the reworked alphabetic identifier, but does contain all changes required to make unit operation identical to a newly manufactured unit having the same alphabetic identifier. Therefore, a unit reworked to a specific alphabetic identifier may not have the exact components and/or the same physical appearance as a newly manufactured unit having the same alphabetic identifier.

Only alphabetic identifiers that result in schematic changes are covered in this section. Therefore, if a unit or subassembly has an alphabetic identifier that falls between identifiers on the schematic changes page, or after the last identifier on the schematic changes page up to and including the latest effectivity listed below, the electrical configuration is represented by the earlier alphabetic identifier listed on the schematic changes page.

7.2 CONFIGURATION EFFECTIVITY

Listed below are the units/subassemblies with the latest alphabetic identifier covered by this document.

UNIT/SUBASSEMBLY	PART NUMBER	LATEST EFFECTIVITY
628K-1 Receiver-Transmitter	622-6604-001	REV H
Chassis A1	652-0682-001	REV G



628K-1 Receiver-Transmitter, Interconnect Diagram
Figure 7-1

Rockwell
International